GEORGE DANIELS
ALL IN GOOD TIME

Reflections of a WATCHMAKER

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PWP

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Contents

Introduction

Publisher's Note

Foreword

1 All in Good Time

2 Introduction to Watches

3 A Change of Careers

4 Watches Versus Bentleys

5 Introduction to Breguet

6 The First Daniels Watch

7 Developing the Co-axial Escapement

8 Not Too Technical

9 Alfa and Omega

10 Wheels

Postscript

Working with George

Afterword

Complete Watch and Clock Production

Plates

Riversdale, 2010

Introduction

I am encouraged to publish this story in response to those who ask how I started watchmaking and where I actually learnt to make watches. A further encouragement was a letter from my mother, written in her 90th year in which she apologised for my ‘miserable childhood’. Until then I had not given the subject any concentrated thought but fell to doing so and wrote down what I recalled. This account is the unintentional outcome. I concluded that I had too much curiosity, optimism and opportunism to be miserable, and had never been bored, inactive or profoundly despondent. The time was always fully occupied so that I have done everything I set out to do and left nothing undone. It would be too dispiriting to look back and see failure for want of effort! Thus far life has been an enjoyable experience; always doing what I wanted to do, when and where I chose.

I am grateful to all who assisted my ambitions and assure them that I squeezed every last advantage from each opportunity. This is the greatest compliment one can pay a benefactor. The greatest influence was the discovery of the watch as a boy and, later, the names and personalities of those English pioneers who contributed to its development and whom I used as stepping stones to achieve my own aspirations. I pay fullest compliment to their genius.

Motor cars have been prominent in my life for over fifty years. They can be both exhilarating and amusing, and offer ready excuse to escape to most European countries for competitive and social events. Thousands of hours have been spent on their resuscitation but they are simply a pastime. I have never felt the need to make any contribution to the development of the motor car.

One never knows when to finish an autobiography, which form my few recollections seem to have taken, because there is always so much to do. I cannot retire because I feel I have never actually worked. Rather more I have enjoyed hard labour to achieve my own ends and look forward to being able to continue to do so. After some fifty and more years at the watchmaker's bench I have learnt patience and to know that everything will get done 'all in good time'. What better than to continue as before!

Looking back now to 1969 and the completion of my first watch I see a vastly different watchmaking industry. Then, I was the only maker of handmade individual watches working long hours to establish a London workshop and gain the attention of those collectors who could understand what I considered to be the importance of such a venture.

To encourage others to follow I wrote *Watchmaking*, a complete treatise on the practice of watchmaking by hand methods. As a consequence there are now several successful workshops in England and Europe whose exponents are pleased to acknowledge the usefulness of this book.

My abiding interest in escapements, the ticking heart of the watch, upon which its final performance depends, led to the invention of my own systems which are now taken up by the industry.

The introduction of the quartz watch in the 1960s stopped any further development of the mechanical watch. To guide the industry back to the essential development of new escapements I wrote *The Practical Watch Escapement*. This guide to principles and design has now encouraged some makers, as was intended, to design their own escapements. It will be interesting to see how they fare in this most exacting department of watchmaking. Thus far, the results are not very promising and suggest the necessity for closer study and less self-acclaim for their conceptions. Considering that it took some 200 years to improve on the lever escapement it is not to be supposed that a further improvement will casually make an appearance.

I thank my daughter Sara Jane for her typing in the early chaotic days of deciding what to include or if any part of it was worth the effort of writing. Wet weather, as with earlier books, was the decider. Writing is a pleasurable pastime when it is raining. Much of the content was written in London clubs while killing time waiting in bad weather for the hour of action.

My printer has been most helpful with advice and allowing me to make changes and then more changes while, at the same time, managing to produce a clean typescript.

I am grateful to Major Norry Radcliffe, sometime parachutist and school headmaster who perused the typescript for mistakes and made suggestions and corrections as necessary.

G D

October 2000

Publisher's Note

It was always George Daniels's intention to reprint his autobiography – this unique account of a life of endeavour, determination and enjoyment. Sadly, George passed away before this new edition could be completed. We have continued the project and here include many new images as well as contributions from his protégé, Roger Smith, and his long-time friend, David Newman, who add their testaments to this remarkable story.

November 2012

Foreword

George Daniels entered my life in 1970, in the street outside my house in South London. Whipping by on his BMW motorcycle, he saw me working on my Vincent and stopped to offer advice. He has been giving me advice ever since. We share many interests, including all forms of machinery, be it fast-moving or stationary, but it is his incisive wit and penetrating insight into human motivation that I have valued most highly in our friendship. Examples of these qualities pervade this book.

Thirty years ago, George was just completing his first entirely handmade watch, a pocket timepiece of exquisite workmanship and beauty. Notwithstanding the exceptional quality of his work, no one, except perhaps George himself, could then have proposed that he would go on to become the world's foremost horologist, ranking alongside the greats of all time, Tompion, Harrison, Mudge, Arnold, Earnshaw and Breguet.

It has been said that autobiography is an unrivalled vehicle for telling the truth about other people. Here it is the technicians of the Swiss watch industry who come in for the closest scrutiny. Unsurpassed in the techniques of automated microengineering, they have developed the means to produce precision timepieces at absurdly low prices and have propelled the recent resurgence of the mechanical watch with ever increasing complication of design. But their indulgence in complication has not been accompanied by innovation: at the heart of even the most complex Swiss watch, one that rings alarms, tells the date to the year 3000, and displays the phases of the moon, beats a pacemaker that was designed in all but minor detail in 1754 by the Englishman Thomas Mudge. His lever escapement, with its inherent fault of high friction and need for

frequent cleaning and re-lubrication, has only now been superseded, by George Daniels' co-axial escapement. Despite its manifestly superior properties, it took twenty frustrating years to convince the Swiss technicians that someone outside their ranks could achieve what they did not realise was possible, a near frictionless escapement without need of lubrication. Finally the industry has now adopted his revolutionary design for mass production and a stagnancy of 250 years has ended with the elevation of the mechanical watch to unprecedented standards of efficiency, reliability, longevity and accuracy.

If you were to look through the 'People' section in Hatchard's book shop, you would be struck by the disproportionally small number of works by or about scientists and engineers, compared with the plethora on politicians, film stars, sportsmen and other public figures. The rarity of science biography may well reflect the fact that scientists are focused more on understanding the world around them, divining principles and devising ways to harness natural processes, than they are on themselves. Despite what is arguably an obligation, even the most distinguished scientists have little concern for telling others about their lives, and the names of all but a few are unknown to the public. This is unfortunate, not least because as a motivator of young minds the life can be as inspirational as the work. Fortunately, George has always recognised a need to motivate others and this book, together with his seminal do-it-yourself manual *Watchmaking*, will surely provoke a new generation to build on George's enormous contribution to the science of horology.

George's autobiography reveals facts about his life that will surprise even his closest friends. Most notably, you will witness the triumph of inborn intelligence, ingenuity and singularity of purpose over the least promising of beginnings, a childhood of abject poverty that lacked any form of parental support or encouragement. You will also be astounded by his capacity for self-education and most of all by his indomitable perseverance in the face of seemingly endless hostility from the Swiss industry. I have been inspired by my reading of this book as I hope you will be too.

ANDREW LUMSDEN FRS
Professor of Neurobiology,
King's College London, 2000

1

ALL IN GOOD TIME

THE WAGE EARNER

I made my first consciously definitive decision in August 1939, while standing at a factory bench. I resolved never again, except by force of law, to follow any path that did not appeal to me. I was nearly fourteen, and in my last year at school, but because money was needed to help sustain a large family, I had already been put to work. I had a job in a bedding factory, clipping bed springs together to form the foundations of the company's Sleepeezee mattresses, and to someone already familiar with the mechanical charms of clocks, watches, gramophones and bicycles, it was desperately dull work and truly soul-destroying.

I remember little of my three companions at the bench, all newly started mattress engineers of about my own age. I found nothing of interest in their company. The foreman was thickset, thick-headed and degradingly vulgar in both his speech and his mannerisms. When I diffidently approached him to ask if I might be allowed to work one of the spring-making machines his reply was terse, and his estimation of my worth unflattering. But having spent my life among the rougher elements of the so-called working classes, I was familiar with such expressions, and merely discounted those who uttered them as inferior and useless, including my father, who could even add an element of hatred. To this day I am completely impervious to those for whom I have no regard.

The wages were seven shillings per week, of which I was allowed to retain two, while the remainder was added to my mother's slender purse. Just how this was divided between household necessities and my father's beer I never knew, but my diet did not improve, nor did I acquire any new clothes. One had learnt, however, never to question.

In the neighbouring town of Kingsbury there was a watchmaker's shop which I visited whenever I could. I was on good terms with the proprietor and longed to work there. The shop had no fittings except for a combined bench and counter covered in worn tools, dismantled clock movements and cigarette packets, all mixed up with dust and ash. Because my eyesight was better than the proprietor's he found my assistance useful, and I wished I could spend every day there. But that was impossible; he could offer only five shillings a week for my labours, and the bedding factory paid seven. There was to be no horological career for me, and that was that. My familiarity with the importance of money had generated a resilience to daily circumstance that enabled me to find satisfaction in whatever came to hand, and so I felt no sadness at being deprived of the company of my beloved clocks. I had no alternative and would, as always, just have to get on with it.

Now, for the first time that I could recall, I felt despondent. In my second week of drudgery at the bedding factory I calculated that I would be fifty before I could retire. It would have been foolhardy simply to quit, for this would have incurred the wrath of my parents, whose interests lay in my income. However, being of a resourceful nature, I set about escaping from my depressing situation by other means.

At weekends, after school, it had been my practice to collect wooden boxes from the local shopkeepers and reduce them to firewood for sale. In this way I became well-known to many shop assistants and housewives, and within two weeks of starting at the bedding factory I found employment as an errand boy, delivering groceries to local houses. The work brought many blessings. Firstly, I was out in the open, which I loved. Secondly, because I already knew many of the women I delivered to from my firewood sales, they

made appreciative comments to the manager of my branch of Bishop's Stores in Kenton and so enhanced my position. If, for example, I was late in returning from errands during the cricket season, I would be only mildly chastised. Thirdly, I had the use of the errand bike at weekends and, finally, of profound importance to my mother, the pay was ten shillings a week, of which I kept two shillings and sixpence.

My cup of happiness was truly full to overflowing. Because of the friends I had made selling firewood, it had, in the end, been simple to escape from that dungeon of a bedding factory. And that was when I made my first definitive decision. I am now aware that my parents helped me in that decision. So profoundly uninterested were they in my welfare that they made no prejudiced decisions for me, and I was left entirely to my own devices. Provided I brought home some wages, they had no interest in my occupation. At fourteen years old I was blissfully content with this arrangement, but could not know how very lucky I was. I now realise that this lack of direction as a child left me with an open mind to build a life and career entirely independent from my family, and to enjoy it to the full.

EARLY RECOLLECTIONS

I grew up as one of eleven children. In addition, my father had two other children by a previous marriage. He was a mystery to us children, although I do not recollect my two brothers and eight sisters ever expressing any curiosity about him. We were never visited by grandparents, aunts, uncles or cousins. There seemed to be no relations, and we grew up not expecting to see any. Questions about our background were dismissed with contempt. Then, in 1938, when I was twelve years old, we were visited by my father's sister and her husband (who transpired to be her second husband, she had three altogether). The visit came as an unwelcome surprise to my parents, who were oddly agitated by this unexpected reminder of the past. My aunt was most tenacious, and had discovered my father's address by visiting all the schools in an ever-widening circle from the last

address she had for him in Hackney. Her appearance opened my mind: I no longer felt that we were shrouded in mystery and that we had no place in society. My aunt and I became firm friends and remained so until her death in 1976.

I do not remember my father ever saying a kind word to anyone. He was violent and intemperate, and seemed to nurse a hatred for everyone he came into contact with. He was of medium build with undistinguished features, unless one counted a small moustache. He was a carpenter by trade, but he never liked work, and in 1938, when he was forty-nine years old, gave it up altogether. Henceforth he made no provision for his family but, on the grounds that he was too ill to work, simply left it to my mother to wheedle money from whatever source of charity was available. He managed to keep up this pretence for the rest of his life. He died in 1958.

As I got to know my aunt better in the years following her first unexpected visit, I learnt something of my father's history. He was one of two sons of a furniture maker in Hackney, a centre for wood workers in the late nineteenth and early twentieth centuries. My grandfather was what is sometimes described as larger than life. He was big, powerful, generous and just. But like so many successful, self-made artisans he liked to spend his evenings boozing. He could become very violent when drunk and was easily provoked. Not that this was unusual in the East End of London at that time. Local quarrels and fighting were commonplace, especially on Saturdays when whole communities would spend the evening in the local pubs – of which there were very many – erasing the misery of the week's toil. My grandfather would take his family along, and as often as not they would fall out and begin fighting among themselves on the way home.

Even as a young man my father was temperamental and very erratic in his habits. He was treated generously by my grandfather, who would toss him a golden guinea when he was irritable and obstinate at the factory and tell him to take the day off. He was clever with hands, and was skilled with radio, building several radio sets from the component parts then readily available. Indeed, he never found it necessary to buy a radio; chassis frames and the

more complex tuning devices could be bought from local shops, while wire coils and various other components could be made. When loudspeakers took the place of earphones he built them with wooden frames covered in cloth treated with aeroplane dope. In our early days, c.1930, we children were not allowed to touch the wireless, as it was then called, but we did have a crystal set. This was made with a coil of wire and a small piece of crystal. Contact between the two was made by probing the crystal with an adjustable wire until the station was picked up in the earphones.

In later years my father built a radiogram and by 1940 had built his own television set, ready for the reopening of Alexandra Palace Studios after the war. But he could never find the necessary tranquillity of mind to make the most of his talents, and the habits he acquired as a young man in Hackney remained with him throughout his life. His first wife had been a music-hall singer who, my aunt told me, had died of pneumonia as a result of being beaten by him so that she fell down stairs and suffered severe injuries. We children accepted his drunken violence as part of life, though not without some fear.

My aunt told me many other stories about my newly discovered relations. One in particular epitomises the relationship between my grandfather and father. On one occasion my father had abandoned his first wife and gone to South Africa to make a fresh start. After only a few months he wrote home saying that he wanted to return and make up. My grandfather immediately sent a telegram entreating him to come home and assuring him that all was forgiven and forgotten. In due course my father arrived back at Southampton and was met by his family at the head of a welcoming brass band. Festivities started as soon as they reached the hotel. They continued into the night, and vast quantities of drink were consumed. In the early hours of the morning my aunt retired to bed, pleased with the family spirit that had been revived by my father’s return to the fold. Shortly afterwards, however, she was woken by confused noises coming from the courtyard, where she discovered my father and grandfather in physical conflict!

My mother was born in 1901, the daughter of a colliery official in Durham. She grew up in a house devoid of affection and at fourteen was put to work as a live-in scullery maid. The work entailed long hours, from lighting the fires early in the morning to cleaning the kitchen utensils after the supper was cleared away late in the evening. Like my father she had been married before. She was twenty-two when she married her first husband, a Royal Naval Commander thirty years her senior. He died soon after the birth of their only child, my future half-sister. Her subsequent marriage to my father produced three sons, of whom I am the eldest, and eight daughters. None were welcome.

My mother was a woman of huge native intelligence. Both quick on her feet and deft with her fingers, she could do huge amounts of work with speed and concentration. She had no love for her work but was puritanical about it. It was simply there, and therefore had to be done as swiftly as possible. No matter what one's circumstances, no matter how bereft of comfort, there was no excuse for uncleanliness. Her mind was as agile as her body and she could add long columns of figures, including farthings, in her head without error. No one ever short-changed or outwitted her. She could assess a situation almost before it developed and gain any advantage that was to be had, and because she had so little money to spend even on necessities, she was skilled at gleaning and bargain hunting. She gathered in old clothes, shoes and toys for her expanding family from any source available. The harshness of her upbringing and her married life had made her cynical and avaricious. She trusted no one, and had no patience with people if there was no gain to be had. So great was the daily anxiety of finding sufficient food and clothing for her many children that she was perpetually bad-tempered. Her behaviour to us was often vicious. There could be no discussion on any matter once she had issued her orders. Instant obedience was expected and a moment's hesitation would bring an impatient slap across the mouth and face. To utter a sound against this usually unjust punishment would bring immediate retribution from the other hand. The safest thing was to keep quiet and stay out of sight. In the eighteen years I lived at home she never addressed a kind word to me. Consequently

there was no bond of affection between us, and I have no pleasant memories of life with her.

But there is no animosity. I well remember the bleakness of her circumstances and the misery she suffered at the violent hands of her husband. Bruises and black eyes were common and she was nothing more than a convenient scullion to him. She didn't have to marry him, but as a widow with a two-year-old child and another on the way, her only alternative was shame and misery. At least in marriage she had respectability and misery. In the working-class environment of that time, respectability was all one had to hang on to. I saw her only half a dozen times in her last forty years, and on each occasion her sole topic of conversation was criticism of her children. It was a curious and useless means of trying to curry favour and affection from whomever she was talking to. To have eleven children, and not a true friend among them, was a tragedy for her, and one she could never understand. In 1991, two years before her death, she wrote to me apologising for my 'miserable home life'. I had never mentioned the subject.

LIFE AT HOME

I have already referred to the secrecy that surrounded my parents' lives. On one occasion, as a small boy, I asked where I was born, and was met with a torrent of abuse: I was prying and causing trouble. My existence was never discussed, only despised, and I never asked again. But I knew there was some mystery about me. I was not very curious about it, but I knew it was the reason for the contempt my parents had for me. It was not until I was in my early twenties and in need of a passport that I discovered I had no birth certificate, simply because I had not been officially born. Investigation based upon information supplied by my kindly aunt produced a christening certificate in the name of George Cadou, the name of my mother's first husband. A comparison with his death certificate showed that he could not be my father, and so the great mystery was revealed. I had been born before my parents were

married. This seemed to me to be very little reason for the hatred and misery that had always been inflicted on me. In his most abusive moods my father would always refer to me as ‘the bastard’, and so clearly displayed his hatred for my existence. It is difficult for a very small child to know what to make of a violent parent. I just kept out of his way as much as possible. In later years my mother-in-law advised me that ‘it is a wise child that knows its own father!’

From the age of two I can clearly remember the poor conditions in which we lived. There were three of us at that stage: myself, my elder stepsister Eileen, and my younger sister Georgina. We all slept in the same bed, without clothes, and with just one blanket to cover ourselves. When the weather was very cold we would lay an old rain coat over the blanket for extra warmth. There was no heating, and frost formed thickly on the insides of the window panes. In the mornings, to while away the time until my father left for work and it was safe to come out, we would kneel in a close group on the bed with the blanket pulled around our shoulders and I would lead in singing and story telling. My songs and stories, which I made up, were very popular. When my mother was out during the day we would have the run of the house and got up to every sort of mischief. In the evenings we would be put to bed, and my parents would go to the pub and stay there until closing time.

We moved frequently. Most of my early years were spent in flats above shops, and I can remember five different flats in as many years. Often we moved at night. My father’s chief concern was the radio, and he would carry this himself. Apart from a washstand in my parents bedroom, two beds, a table and two chairs, I cannot remember there being any furniture, so a move was a fairly simple matter. One was made with a hand cart to another flat across the street. Everything that was movable was taken. The wires and nails my mother used to hang the curtains were carefully taken from one flat to another. The same pieces of linoleum were laid on the floor and tacked down. In all it amounted to so little that everything would be in position in a matter of hours.

The earliest flats we occupied were comprised of two rooms and a kitchen over the shop, and an attic above. My parents occupied

one of the lower rooms, we children slept in the attic, and the second lower room was the living room. There was no bathroom, and the only sink and taps were in the kitchen. Water was available if the rates were paid. On more than one occasion I was sent to a neighbour for a bucket of water because our supply had been cut off. It seems a strange thing to do. Cutting off the water only made us miserable, was unhygienic, and brought no benefit to the Water Board. But there was very little social charity in the early 1930s.

The rooms were lit by gas lamps, but we were not allowed a lamp in the attic. Only one lamp was ever used in any room, so it was rather gloomy in the winter evenings. The lamps burned with a faint hiss, much like a kettle singing, which I came to regard as rather homely. When my parents were in the pub during the evening I enjoyed sitting silently in the gas-lit kitchen listening to the gas hissing and watching mice, unaware of my presence, scuttling along the skirting boards. This particular flat was above a clothes shop in Watling Avenue in Burnt Oak, Edgware, North London.

I was too young for school, but my stepsister attended one, and from her I learnt to read her infant-school reader. She simply told me what the word meant and I remembered what she said. I can recall now how sharply and clearly the words seemed to stand out from the paper; they were unforgettable. It was a very satisfying thing to be able to read, even if only a little, and I practised hard. There were no books in the house, but occasionally I would find a newspaper, and in this way I learnt to understand the humour of cartoon strips and their characters. Pip, Squeak and Wilfred were my favourites. These proved useful when I started school: I discovered I could draw, and called upon my recollection of the cartoons to bring motion and life into the drawings. In later school life I was encouraged to believe that I had a certain ability in drawing and painting, and I was much in demand by teachers who wanted special drawings for their classrooms. A place was found for me to train at college, but in my heart I believed that my talent for drawing was limited and I would never be good enough to achieve real success. Eventually the decision was made for me by the bedding factory.

During the day I would roam the streets of Burnt Oak looking for things of interest. There were none at home, and I was safely out of reach of my mother's sharp tongue and fast-moving hands. By the time I was four years old I could feed myself from scraps gleaned from the shops and street traders. I knew every trader and every alley in the district and could amuse myself from early morning until dark, when I would return home. Sometimes I got hurt and spent a night or two in hospital. Once I got lost and, late at night, my parents found me in the police station at Mill Hill enjoying currant cake and tea.

In the early morning the dogs would be out catching rats in the alley behind the shops. The dead rats were simply left strewn along the gutter. During the day the delivery vans would arrive and I could glean a few tasty morsels to eat. In the evening the shops stayed open until nine o'clock, and on Saturdays until after eleven o'clock in order to catch the late-night drinkers going home from the pubs. Saturday was market day, and the road was lined with costermongers' carts laden with fruit, fish, vegetables, cheap clothes and toys. In between them, standing at the kerb, were trinket and novelty sellers. Two tall thin women appeared every market day selling matches, and all day they chanted their wares: 'Don't forget your matches! Penny a box, three for tuppence!' On a good day their trays would be empty when the market closed in the evening.

Prices would be slashed to dispose of meat and other perishables, for there were no deep freezes. Ice for the fishmonger and butcher was delivered by open wagon, and blocks of ice some forty-five centimetres square were laboriously humped, wrapped in sacking, into the shops. There they were crushed with ice picks and spread over the displays. If by chance a piece flew in my direction then I would have a cool treat on a hot day. The shops were closed on Sunday, and Monday was 'bubble and squeak' and 'shepherd's pie' day. So it was important to sell as much as possible on Saturday night. I found these nights very exciting: the bright lights, and the shouting from the sellers as they encouraged people to buy. The general atmosphere was much the same at Christmas, when the shops stayed open until midnight. We children would press our

noses to the shop windows and gaze entranced at the magic things lit up on display. We knew we would never get the exciting toys, but we did get presents for Christmas: blow-football for the boys, dolls for the girls, and sundry small and inexpensive amusements. My mother worked hard at Christmas to collect toys from charitable sources and always managed a comprehensive spread for the table, so that Christmas really was a highlight. She also made sure we were included in one of the charitable parties that were held by the church and Salvation Army. She saw herself as slighted if her family were left out. I never enjoyed them fully; I liked the food and was pleased to get a present, but I hated the games.

Christmas was the only time we received gifts, and then only until we were fourteen years old, at the latest. After that we no longer qualified. Birthday presents were never mentioned, and we never remembered our birthdays. As a consequence I never counted a birthday until my wife gave me a present in the year we married. I was thirty-eight years old. I still cannot understand why people want to remember birthdays, but mothers are obviously sentimental about their sons reaching maturity, even when they never assisted in the process. On my twenty-first birthday, while serving in the Middle East, I received a birthday card. I felt vaguely irritated that my family should in any way try to enter my life away from them.

STARTING SCHOOL

In 1931 we moved again, this time to another flat over a shop on the other side of the high street, Watling Avenue. In that year I started school, which was very exciting. Not only was I out of the house, but I now had plenty to occupy my mind. I remember every detail of the school, run by tall, dignified Miss Crawford, who wore her auburn hair in a bun. The entrance hall was covered with a rug made by earlier pupils. I had never seen a rug before except in a shop, and it was my first chance to walk on one. The walls were covered with glazed tiles, which also were a revelation to me. I remember thinking how convenient they would be to wipe clean after writing on them. I

was much addicted to drawing on walls, as there wasn't any paper at home.

The classroom, spotlessly clean and tidy, was warm and dry and smelled of chalk. There were thirty of us new pupils. Some looked apprehensive, a few shed tears of nervousness, and no one ventured to speak. Across the top of the blackboard were the magic symbols of the alphabet which we were to learn to use by chanting the letter and its meaning. Arithmetical tables were pinned to the walls and we were to learn these also by daily chanting. Such methods have now been cast aside as old-fashioned and boring, but from the noise we made it was evident that we all enjoyed the exercise once it had become familiar and therefore easier to remember. Whatever we may individually have thought, we learnt quickly and surely by repetition, while our teachers, unlike their modern counterparts, did not sacrifice us to the untried airy-fairy ideas that have left so many pupils without the basic knowledge that is so essential in later life.

Being in close contact with others of my own age, I sensed that there were obvious differences between us. Even at the tender age of five we were separated by class. They were lovingly dressed in clean and tidy clothes, while I wore unpolished shoes, a shirt with no button at the collar and a crumpled jersey. I never made any friends, but this was not surprising as I would never have dared to invite anyone home for tea, and in any case they probably would not enjoy bread and margarine and a tin mug of tea while standing at the table. If anyone had asked me home for tea I would have run all the way there!

When it was accepted that I could not afford the halfpenny per day for school milk I was given it free. The scruffy clothes could have been put down to eccentricity, but the free milk established me as a genuine pauper. I didn't mind, I enjoyed the milk and preserved my independence.

I had an immediate success in class when, with slate and crayon, I drew a bird. The class was instructed to view this masterpiece and take note of what a bird looked like. It was also discovered that I could recognise words, and I was called upon to

describe ‘cat’, ‘dog’, ‘bone’, ‘jump’ and the like. For this I received much praise, a novel experience for me. And so it was that I came to adore my school and Miss Crawford, who was so kind and encouraging. I would have walked on burning coals for the adorable Miss Crawford. I had never been so happy, and whistled about the flat, so refreshed was my spirit. For this I earned the wrath of my mother. She could never abide people who displayed cheerfulness, guessing that they were either simple or ‘up to something’, a favourite expression of hers.

2

INTRODUCTION TO WATCHES

It was during my first year at school that I first saw the inside of a watch. It was a cheap pocket watch that somehow found its way into our flat. Neither my father nor my mother owned one, and if they had it would have been sold at once. There was never anything of value in the house. I had an intense desire to see inside the case, and eventually I got it open. It contained a movement of a type that I now know of as Roskopf, named after the designer. They were the cheapest watches available. Their price was then half a crown, and by the time I was nine years old this had been reduced to one shilling and eleven pence.

I examined the watch in silence for a long time, for so long, in fact, that my mother came to see what I was doing. In our household any long silence was regarded as suspicious – someone was ‘up to something’. The movement was broken and so I could learn nothing from it, but I found the minute components fascinating especially the three-dimensional effect of the gears laid one upon the other. Its silence was frustrating, but it led me to take an interest in the alarm clock on the mantle shelf. This, our only clock, was made in America by the Westclox Company. Its white paper dial bore the name Big Ben Alarm and the nickel-plated case had levers for Alarm/Silence and Repeat/Steady (the latter being the mechanical equivalent of today’s electronic snooze button). At the first opportunity I took the back off the clock.

I knew that clocks needed winding, and now I could see the spring and its workings. The fascination of the movement was the

orderliness of its function. No luck or judgment was needed, as with most other things in life. Every component had a function which it passed on to each succeeding component in a train of actions. It was preordained, certain and precise. It started with the mainspring and terminated at the balance wheel, oscillating in gently ticking majesty as the hairspring dilated and contracted in tranquil harmony. Part of its fascination for me was its complete independence from outside assistance. It needed no batteries or plugging in, it was self-contained and made no demands. I couldn't have expressed it at the time but it exactly echoed my own philosophy and made a great impression on me.

I had some trouble getting the back of the clock on again, but finally succeeded and replaced it on its shelf. Whenever opportunity arose I would re-examine the clock until I became familiar with the shape and texture of every component. No more clocks or watches were available for my examination, and my horological studies ceased for some years, but it was comforting to realise that here was a subject that I instinctively understood, and one that would have no secrets from me.

Our flat was over an open-fronted shop from which the proprietor, Mr Ashley, sold plants, shrubs and small trees. He was a kindly man, and in the winter let my sister and I sit round his brazier. This was made from a perforated oil drum sat on bricks, and was filled with glowing coal. Looking back, I realise that we were desperately poor. We had no fuel and therefore no fire, so we derived much comfort from the brazier on cold days. Mr Ashley would sometimes entertain us by producing a ten-shilling note which he would hold over the fire as if to burn it. This was wasted on my sister and me because we didn't know what ten shillings was, but it had an electrifying effect on Sybil, the rather simple woman who helped look after the shop. She would throw up her hands and give a little shriek of alarm, entreating Mr Ashley to take care. One day when she did this, her watch shook off her wrist and fell onto the floor. To my joy it was decided to open it and examine it for possible damage. The open watch was laid on the table and the four of us crowded round to examine the movement. Mr Ashley was of the view

that it was going well, which was a great relief to Sybil. I can remember the details clearly. It had a mother-of-pearl dial and a gilded movement. The wheels were minute and, for the first time in a watch, I could see the escapement working. Like the clock, its self-contained life was fascinating to observe.

CHILDHOOD RECOLLECTIONS

Access to our flat was by an iron stair inside the back yard of the shop. A wooden fence ran between the yards and a back alley, and had a door for each flat. There were some thirty or so doors in the fence. In those days taking bets away from the race course was illegal, but bookmakers maintained their business by using runners to collect the bets in the street. The doors were very convenient for this, and the runner would hide behind a door and wait for the punters to appear with their shilling each way. I never knew how they decided which door the runner was secreted behind, but they never had any trouble placing their bets. The police were aware of this, and every so often a constable was sent over to make an arrest. We children knew which door hid the offender and would follow the constable with mounting excitement as he approached the runner. There was no animosity or ill will on either side. The runner understood that the constable was under orders to make an arrest, and the constable knew that the runner was taking a calculated risk; the two-pound fine would be paid by the bookmaker. I never knew what happened to the stake money. Events like these were a useful lesson to us; we were never afraid or resentful of the police. They were stern but kindly men, who understood the difficulty of earning an unskilled living in the 1930s.

My mother had one respectable dress of dark blue with white spots, and one pair of shoes which were too small, probably to make her feet look more dainty. These she wore on the nightly excursion to the pub. The favourite pub was The Bald Faced Stag in the Edgware Road. It had a back garden with peacocks which were a source of wonder as they spread their tails in display. While my parents were

in the pub we would sit at home and listen to the wireless and try not to fall asleep in case we were sent to bed early on future occasions. They would return at about 11.30 p.m.

Our diet was very simple. For breakfast we had bread and dripping, much enjoyed. I would come home from school for lunch, which would be hot potatoes and bacon scraps, corned beef, minced beef or some similar cheap dish. For tea we had bread and margarine and a mug of tea. On good days a scrape of jam would be added to the bread, and at weekends my mother would make slabs of pastry cake with currents. There were no chairs for us children, and we stood round the table for meals. My parents ate at a separate table on the only two chairs we possessed. Meals were eaten in silence to avoid offending my father.

It was my job to buy the bread from the baker's shop across the street. By the age of five I was very skilled at crossing the busy road without any assistance from pedestrian crossings or traffic lights which, although invented by then, certainly did not exist in the Edgware Road. My instructions were to buy a stale loaf, and for this I was furnished with one penny. It was always an anxious errand, for one never knew what one's fortune would be. If I was given a small loaf or one that was very stale I would be scolded, even though I had no control over the transaction. The loaf was damped with water and then put in the oven for resuscitation. On one occasion the loaf I brought back was so stale that it was inedible. In anger and frustration my mother screamed abuse and threw the loaf at me. I was so small that it knocked me over.

My parents' diet was more ambitious. They would have a little butter and cheese at weekends, and sometimes a kipper or herring for Saturday tea. We children never felt resentful or deprived. To us it was simply the natural order of things. I can only remember having one special treat. One Easter, when I was about four years old, we were given a boiled egg. I remember it well, sitting in its penguin-shaped egg cup. We made them last for at least half an hour before the final crumbs were consumed.

Cooking was done on a black gas stove with brass taps. The gas was obtained by inserting a shilling in the slot meter or

sometimes, of necessity, a dummy coin. The gas company was up to this one, and overcharged for the gas, so that a rebate would be due. The rebate was, of course, paid out there and then with the dummy coins. Thus it could be said that my mother, a past master in the art of frugality, was merely avoiding being overcharged for the gas.

Now that I was attending school my mind was much more occupied than before, and I didn't roam the streets as much. In the winter evenings I would read my school books, and in summer play in the alley or forage in the back yards of the shops.

In the summer holidays I would leave home as early as possible and not return until evening. The holiday lasted just over a month, an incomprehensibly long period of time to me, and I was afraid that, at the end of it, I would be too old to return to school. I did not dare tell my mother this, lest she discover my dislike of home, and so it became a very real anxiety, only allayed, eventually, by the end of the holidays. And when my dear Miss Crawford requested that I draw a picture of Caractacus to hang in the classroom, my happiness was complete.

I spent the holidays roaming the streets and foraging for food. Occasionally I would strike up a friendship with a boy on one of the council estates, and his mother would feed me with soup and some bread and cheese. Vast areas of Burnt Oak and Edgware were covered with council estates. To me, their occupants were upper-class citizens; their houses had furniture, and beds with sheets, and they slept in pyjamas (my only experience of these curious garments was in hospital). Their children wore tidy clothes and shoes without holes in the soles. My shoes were stuffed with cardboard and were often my sister's cast-offs. At best I would have a change of shirt or jersey once every two weeks. None of us ever saw a toothbrush, although the absence of soft drinks and sweets ensured that we all had strong teeth. Despite the humiliation that I sometimes felt in the company of those who liked to patronise and make it apparent that their children were better off, I never envied them their position or possessions. Indeed, I much preferred my own way of life, and secretly felt that they were rather sissy and incapable of fending for

themselves. And another thing: I could whistle in tune. None of them could do that!

I found whistling a great solace in times of stress. Next door to Mr Ashley was a music shop from which emanated gramophone recordings of the popular singers of the day: Jack Payne, Roy Fox, Ambrose, and many other familiar names. When feeling neglected, I would whistle their repertoires and recover my spirits. Now that I travel so much, and often have time to fill between connections, I always carry a mouth organ and play those same melodies. Curiously, playing the mouth organ at an airport attracts less attention than whistling.

When no free sustenance was available I would examine the back yards of the shops. It was surprising how much good food was wasted while so many people were going hungry. Thus an apple, orange, or pear, bruised and therefore unsaleable, would make a meal. Pennies could be earned by assisting at the stalls, cleaning up and stacking empty crates.

I once struck up a friendship with the boy next door. He was older than me, and very skilled at gleaning. On bleak days when there was no money to earn and no unsold fruit to be had, we would steal eggs from a shop-front stall and boil them in a tin of water over a fire of sticks. My friend was so sophisticated that after the meal he would poke about among the tree roots and produce a piece of ‘smoke wood’, which he would then proceed to smoke like a cigar. I tried this only once and was ill for the rest of the day.

My friend had many contacts, and through them would find casual work like sweeping up or stacking baskets and boxes ready for collection. We would travel the length of Watling Avenue sitting on the rear bumpers of the single-decker buses, a convenient way of travelling from one job to another. He was very plucky and I felt obliged to follow him. Remembering how bumpy it was riding on the rear of the bus, and how tightly we had to hold on, we were lucky not to have had an accident.

For entertainment there was Hendon Aerodrome and de Havilland’s airfield in Stag Lane. De Havilland built their own aircraft in sheds along one side of the airfield. I believe they also made their

own motors, at least the four-cylinder models for their famous Moth series of biplanes. The engines would be run up for hour upon hour to test their stamina, the noise echoing through the streets for a mile or more.

Whenever I hear a piston-engined aeroplane overhead, it reminds me of those carefree days watching the activities in de Havilland's 'Garden of Eden', as it was then known to its occupants and pilots.

Hendon Aerodrome was the old Graham White Aviation Club, and the ornate iron gates of the club still stand at the perimeter. In the 1930s it was an RAF station and has now become The Royal Air Force Museum. I used to climb the fence and from there watch the fighter planes landing after exercises. As well as the pilot, the Hawker Hart biplanes carried an observer with a machine gun. They grew used to seeing me sitting on the fence and often returned my wave as they came in. One red-letter day I was picked up at the gate, which was always open, and taken to the mess for tea and cake. There I was asked if I wanted to be a pilot. 'No!' I said. At home I had been made to believe that I was nothing, and so I accepted that the edge of the airfield was as near as I would ever get to an aeroplane. But I didn't want them to know that.

Every year there was an air display, and there would be bombing runs by the huge, lumbering, Handley Page bombers with their cockpits open and their machine guns bristling, dropping flour bags on model buildings while fighter planes swooped among them. For light entertainment there were groups of Hawker Harts linked together with ribbons, performing aerobatics. It was the RAF's proud boast that they never broke a ribbon, but I can certainly remember seeing one or two trailing in the slipstream. Other attractions at Hendon included the arrival one day of Count Cierva's Autogiro. This was science-fiction stuff to me, and even more exciting than the Graf Zeppelin that had passed overhead earlier that year.

MORE MOVING

Between 1931 and 1933 we moved house three times, and this meant saying goodbye to Miss Crawford. I did not see her again until 1950, when I met her by chance in the street. I had no difficulty in recognising her. She assured me that her pupils from the Thirties were much better value than those of the Fifties. By 1934 we had moved again, this time to a flat in Edgware. We were forbidden to make a sound, in case we disturbed our landlord, who owned the grocery shop below.

My new school was very small and old-fashioned. It had small, high windows and high ceilings. I soon established a reputation for art work, and so became the general illustrator for the art room. On one occasion I must have really excelled myself, for I was awarded a prize of two halfpennies, which I spent on the way home.

In Edgware we celebrated the 1935 Silver Jubilee of King George V. The following year we moved to Kenton, where, for the first time, we occupied a house. I still had four years of school to do, and attended Kenton Junior School. There I again found my depiction of historic events to be most beneficial. I had discovered perspective, and began to specialise in drawing buildings and especially castles, whose battlements offered much scope for perspective views. I was also asked to illustrate the alphabet in colour. As a consequence of my success in art, my poor results in other subjects were again overlooked. The headmaster was a kindly and inoffensive man, and was easily recognised by his £100 Ford motor car. He was the only man in a radius of some miles who owned a car, and he thus earned enormous respect. In those days all teachers were respected as most worthy citizens, dedicated to improving the children. Most rode bicycles to and from school and we always waved cheerfully and respectfully. But a headmaster in a car was too dignified to be waved at, although we felt honoured to think that we knew such an important man.

In 1938 I graduated to the senior school where, for various reasons, my talents were not encouraged, although I put on the best show I could. They were an unhappy two years. I was always conscious of my shabby clothes and, although I still scored well in art, I was increasingly aware of my limited academic ability. Great

emphasis was put on history, geography, mathematics and composition, but I had no interest in these subjects at that time and could not take them in. My teacher was a pompous little fat man who spent most of his time talking about the First World War, in which he had been a medical orderly. After a year of looking at my untidy hair (it was never combed), and my Wellington boots (I had no shoes), he sent me down to a lower class. This was taken by the science master, who was a kindly and courteous man and spoke politely even to me. I prospered so well under his guidance that the following year I was top of the class and was sent back up to the little fat man again.

But the teacher who made the most impression on me did so not because of his teaching ability, for I cannot even remember what his subject was, but because of his clothes. He had thick-soled leather boots and a heavy Harris tweed suit, and the things I longed for more than anything else during a wet, cold winter were warm clothes and thick-soled boots. They would have been very welcome when doing the firewood round in the winter, for the shops from which I collected the wood boxes were a three-mile walk there and back, on top of the round itself, which was several miles long. Bad weather was good for sales, but it was sometimes very cold and, in wet weather without suitable clothes, most uncomfortable.

Shopping was another thing I had to do in all weathers. For this I had a large canvas bag made by my father, which, when filled with 6 kg of potatoes, other vegetables and half a dozen lamb breasts, could weigh as much as 14 kg. I would trudge home with it on my shoulder and change sides every 300 metres or so. At that time lamb breasts were not much sought after, and so could be had very cheaply. They would be picked clean for Sunday lunch, and while cooking produced many pounds of dripping, which was a staple food for breakfast. In one way the trudge home was beneficial, for it taught me stoicism. Nevertheless, some stout boots and a warm coat would have been welcome.

During those four years at Kenton I again became interested in watches and clocks. My firewood-selling at weekends enabled me to buy clocks from jumble sales, so I was able to learn more about

them. My technique was to attend one of the many sales held throughout the year, and pick out a likely clock. At that time my interest was in pendulum clocks, and those available were mainly cheap American examples or marble-cased French clocks. Such clocks were marked up at between one and two shillings and the chances of their selling were remote because the cost of repair would exceed the cost of purchase. By waiting until the sale was over I could often buy the clocks for as little as sixpence, which was often all I had. I bought and repaired several such clocks and learnt a lot from them. Another useful source of clocks was empty houses, easily entered by an open lower window or in some cases an open back door. I found and acquired several clocks in this way, and gramophones, too. The spring-driven gramophones with Garrard or Thorens motors were plentiful and were often discarded with the introduction of the electric gramophone in the 1930s. I had little use for them, but admired their fine helical gearing and silent operation. Among my library of three records was a recording of Bing Crosby singing ‘Home on the Range’. In those days he was a deep baritone and I had never seen a picture of him. Paul Robeson, on the other hand, who also had a rich voice, I knew was large and brown. So by an association of ideas, I visualised Bing Crosby as a six-foot, twelve-stone black man, and was most disillusioned when I eventually saw him on the cinema screen.

Now that my school fellows were older, some of them were given watches as presents. Occasionally I was able to improve my knowledge of watches by prodding some of them to life after they were damaged by rough play. My knowledge was extremely limited, and I was hampered by a lack of tools, so I probably did more harm than good. I joined the newly built Kenton library, and made full use of the horological books available for loan. The staff were very helpful: they would kindly search for books, and never fined me when I brought them back late. By this means I learnt the names of the different escapements as I came across them, and of the names and characters of the makers and inventors of the mechanisms. The celebrated *Watch and Clockmakers’ Handbook, Dictionary and Guide*, by F.J. Britten, who had been secretary of the British

Horological Institute, was a constant source of fascination. It was an horological bible to me. I read it over and over again and memorised most of it. It had not occurred to me that clocks and watches needed to be invented. I simply assumed their existence. Reading about the mechanisms and especially the escapements, with their rhythmic and seemingly perpetual counting of the passing seconds, brought home to me the importance of the inventions and their makers. None of my schoolmates knew of them and, as their names became more familiar, I felt I knew them personally, and was pleased to think I understood their importance. It was to be a further twenty years before I was able to examine their work and begin to understand their philosophy. Little did I know then how much that book would influence my life. Sixty years later, I still occasionally refer to Britten, and recall the thrill of acquiring knowledge of a favourite subject, away from the unkind disciplines of boring school days.

So I learnt what I could about clocks and watches, and even made some pocket money repairing them. As I approached the age of fourteen and my last term at the hated school, I had no horological prospects in mind, appreciating instinctively that no watchmaker capable of paying a wage was going to give a thought to a scruffy little urchin with a cockney accent and a poor school report.

And so it was that I found myself in the mattress factory.

3

A CHANGE OF CAREERS

While very congenial, my work as an errand boy lacked the interest of the mechanical world I enjoyed so much. It was not constructive, and there was nothing practical to add to one's experience. Having roamed the streets for so long, I knew where there were more exciting things to do, if only a proprietor could be convinced of my usefulness. But my income was equally important, it could not fall below ten shillings if I was to avoid trouble at home.

The main object of my attention was the Kenton Tyre Service. Situated on the Kenton Road opposite Dry's Garage, it was a centre for motor activity and all its ancillaries. The proprietor, Harford Soper, was a tall, loose-limbed American, with intelligent eyes close-set above a beaked nose, the whole perpetually surmounted by a black beret. His principal business was retreading motor tyres, augmented by re-plating car batteries.

The shop was a boy mechanic's dream. Everywhere there were tools of one sort or another. It was a more exciting prospect than the errand boy's routine, and I made a point of calling at the shop once or twice a week so that I became a familiar sight. Occasionally I was able to offer a hand with a small task. It became apparent that I knew the difference between a spanner and a pair of pliers, and before long I took my opportunity to ask for a job. To my huge delight I was accepted, at a weekly wage of fifteen shillings. I hadn't the nerve to ask for more lest I was turned down.

I was sixteen years old, but was expected to play a full part in the various tasks, which included stripping out the dead contents of

the battery cases and preparing the worn tyres for retreading (cutting grooves into the worn tyres to produce an acceptable surface for re-use, then moulding new treads). The year was 1941, and wartime shortages were beginning to affect materials and supplies for making tyres. Our work was therefore of great local use. Our retreaded tyres were not entirely satisfactory because our equipment was old-fashioned and worn. We could not mould the complete tread in one operation because the moulds were designed to mould only one third of the circumference at a time. Just why such an unsatisfactory system should have been designed I can't explain, but as a consequence the joint at each third section was improperly cured and unsuitable for use. It was necessary to cut out the joint and mould in a new piece. It was time-consuming work, and because the two sections of the tread pattern only occasionally aligned themselves through good luck, the finished tyre often looked rather amateurish. The joints not only looked bad but wore unevenly, and sometimes caused the tread to detach from the tyre, but they were cheap at one pound ten shillings each, and as there were no new ones available we stayed in business. Purchasers were advised to drive carefully, and, in particular, to take corners with care. People drove slowly anyway because petrol was rationed, so this helped us.

Soper was a resourceful and ingenious man, and he needed to be, for we had plenty of problems with our equipment and rubber became increasingly scarce. This, together with the diminishing number of drivers able to run a car at all, caused Soper to look about for alternative business. The final impetus to change course came when 'Taffy' Jones the Welshman, who was in charge of the remoulding, was killed while riding his motorbike on his afternoon off. His unprotected head had hit the kerbstone and he had been instantly killed. Taffy was a most likable and congenial man. An ex-coalminer, he walked and stood with a permanent stoop, developed from working in a squat position for thirty years. He had bought the motorbike second-hand only a week earlier. His demise effectively stopped any further retreading work, and we were confined to tyre repairs and battery replacements.

The difference between motoring in the 1940s and motoring today is quite remarkable. Back then, motor-car owners were a minority. Even the cheapest car – then the Ford Model Y – cost £100, equivalent to a year's wage for the average worker. With such prices, economy was vital, and a good living could be made just from repairs. A new inner tube cost three shillings and sixpence (it is remarkable how many things then cost something and an extra sixpence) and was therefore worth repairing. Sometimes I would spend an hour or more repairing a tube at a cost of say one shilling and sixpence, a big saving for the driver. Modern motorists, with their throw-away philosophy, would be astonished at the trouble taken to repair rather than expensively replace.

Then, as an interim measure, we turned to resoling and heeling Wellington boots, which, like most goods made from imported materials, were in short supply. What is more, they were badly needed by defence workers, especially those on 'Fire Watch'. The incendiary bombs dropped at night could not be extinguished by dousing them with water, rather they needed a fine water spray from a stirrup pump. This caused a lot of overspray and, consequently, wet boots. Wellingtons were in demand, and so we moved in to transfer our war effort to their repair. Aluminium die plates were cast from what scrap material was available. Most of this precious metal had been donated to the war effort for building Spitfires, but scrap yards and motor breakers could usually find enough for our purposes. A local foundry did the casting; I then finished the dies. This was most useful training, and I learnt a lot about filing metals and fine surface finishing. I never received any instruction, I was simply expected to get on with it, and failure was never considered.

The soling and heeling went well, but before long we had repaired all or most of the boots in Kenton and its environs, and needed some alternative market to exploit. Soper had developed a personal interest in cinematographic equipment for home movies – here was a possible alternative market for his talents. The blackout and the shortage of transport during winter evenings made travel to and from the theatre or cinema difficult. Why not supply movie equipment for use in the home?

To me this was a most exciting development. We had to purchase silent projectors (from 9.5 mm and 16 mm to the new 17.5 mm format) and convert them to the selenium-cell sound system to project what were then still known as ‘talkies’. It was the first time I had been expected to show intelligent diversity of thought in my work, what we now call ‘lateral thinking’, and there was never the slightest doubt in my mind about what was necessary. I examined a Pathé 9 mm machine and, as with my first sight of a clock mechanism, was able to understand its workings. The understanding of some interesting mechanism or machine has always been a key factor in my life, and on this occasion it opened up a new and, for a sixteen-year-old, most exciting prospect. During 1942 we bought many retired projectors, both the professional 35 mm machines and the smaller-format amateur ones. In addition, of course, we needed talkie films, and I have many fond memories of the musicals of Dick Haymes, Bing Crosby, Paul Robeson, Jeanette McDonald, Nelson Eddy and Diana Durbin, as well as a host of names less easy to recall. They used their art to lift the dispirited minds of the multitudes of workers who performed mundane tasks that offered no future success or horizon to aim for. Indeed, one very popular song of the period was entitled ‘Beyond the Blue Horizon’, which offered a glimpse of a brighter, happier and less painful world that existed if only one could reach it. Few ever did.

Some people were satisfied with silent machines and would watch Harold Lloyd, Mary Pickford, Fatty Arbuckle, Charlie Chaplin and a host of lesser-known Hollywood stars. It was curious to me that Charlie Chaplin was regarded as a great artist. His films seemed far less amusing than others, and indeed I never found him to be funny. Something lacking in me, obviously, for he had a huge following.

The construction of the talkie projectors demanded some ingenuity, for the equipment, being silent, made no concessions to the requirements of the sound converter. The principal difficulty, especially with the 35 mm machines, was to get the sound head close enough to the projection gate. There was a limited number of

frames between the projected image on the screen and the pick-up point on the film for the sound.

It can do no harm at this point to explain how sound on film then worked. The earlier system had used recorded discs, which had to be synchronised with the pictures by lowering the pick-up on to the record at the precise moment of lip movement on the screen. The difficulties of doing this in a dark projection room after an accidental film breakage are too obvious to need further explanation. Later, sound was permanently synchronised. It consisted of a track printed on the edge of the film as a band about 2 mm wide, and close-packed with dashes of varying density. These passed over a light beam, and the rays of light, continually changing according to the varying densities of the sound track, were focused on a selenium cell, which converted the light into electrical energy. As the light was constantly varying according to the soundtrack, the electricity generated by the cell also varied. The electrical pulses were then magnified by an amplifier, and played back as sound from a loud speaker. Modern techniques use a magnetic soundtrack, which is more sensitive and gives better-quality sound.

The most popular conversions were the 9.5 and 16 mm sizes. The new Pathé 17.5 mm projector failed to dominate the 16 mm market with the onset of war, and so films designed for it were converted to 16 mm by making new cams, sprockets and film gates. In our rather primitive workshop we made the components for the sound head, while the amplifiers were built by a local radio mechanic.

Every conversion was a prototype, as on the rare occasions when we had a duplicate machine to convert we found a better system. I learnt the dynamics of flywheels, how to eliminate ‘wow’ and ‘flutter’, how to make toothed sprockets without using a dividing head, and how to devise reciprocating mechanisms and film gates when converting the 17.5 mm projectors. We never used drawings; indeed, we had no drawing board or drawing instruments. Just occasionally, in order to clarify a point, we might make a rough sketch on the back of an envelope or cigarette packet (in those days almost everyone, including myself, smoked cigarettes). This

technique, or rather the absence of one, helped me to develop an ability to see the whole mechanism and its layout in my mind before starting construction. In all fairness, I think it must be said that our finished equipment sometimes, by modern standards, lacked a certain sophistication, but considering the shortages of materials and components, the machines were well-received, and made a change from listening to the wireless, the only other form of entertainment then available. True, the Odeons, Granadas, Ritzes and Plazas were the principal cinema entertainment of the day, but they changed films only once a week. Business boomed for them as patrons queued up for hours to get a seat at between ninepence and one shilling and ninepence. The usual practice was to queue until a seat fell vacant, thus allowing the head of the queue in to fill the vacancy. Because so many people stayed on during a continuous performance, only to get bored halfway through the inevitable and often mindless B feature (as opposed to the A or main film), the new arrivals took their places in the middle of the performance. As the day progressed, seats were filled during the A film, and so when it came round again it was an anti-climax.

The lucky owners of our home projectors, on the other hand, had full control over their viewing, and there was no shortage of films because, although the latest ones were protected by copyright, most were freely copied. Not all owners of a Soper conversion could be described as lucky, however. The 35 mm machines were big, noisy and heavy. Some, like my favourite, the beautifully constructed Kalee from America, weighed as much as 11 kg without its stand and ancillaries, and say 20 kg with them. The films, too, were several times heavier than sub-standard sizes, and more reels were required to allow for the increased thickness of the film material. This material could be dangerous for amateurs, for in order to keep it flexible enough to withstand the snakelike convolutions necessary to thread it through the machine, it contained nitrocellulose, which is highly combustible when exposed to heat. For this reason, the exposed track of the film as it passes through the machine is sealed at each spool to prevent the spread of fire. This can occur when the film breaks just below the gate at the intermittent sprocket, which allows

the exposed frame to rest momentarily in the projection gate before instantaneously advancing the film to the next frame. A sudden jerk can tear the film, which then remains in the gate to receive the full heat of the concentrated illumination. Only a second or two is required to ignite the film, and if the spool is not in a fire-proof container the whole exposed roll will instantly ignite. This did happen once in the early carefree days, and prevented the later sale of such machines to amateur home-movie fans.

In the two years I worked for Soper the sale of talkie projectors never exceeded double figures. This was partly due to the cost, and partly, I think, to the inconvenience of going up to London to hire the films. The work was becoming less exciting as my knowledge increased. I was never allowed both to conceive and to make the complete machine. Soper would always draw the parameter, and, to be fair, that was his privilege. He was, after all, taking the responsibility and paying the piper. Since those days I have experienced the egocentricity of the artist–craftsman, whose passion for knowing exactly what he wants prevents him from sharing either the original conception or the execution of the work. I must also remember that I was only seventeen years old when we parted, and he was fifty, an incomprehensible age to me then. Now, being over fifty, I can understand the difficulties he faced. Our sense of aesthetics was different, and my work lacked his professionalism.

The egocentricity of the artist cannot be changed. Indeed, if it did change there would be no artists, only committees. Even as a young man of seventeen I knew this to be so. The old had an inevitable dominance over the young, and the only way to escape from it was to change, to move on to a different workshop, where one would be allowed some independence of thought. The time had now come for such a change.

Soper was cagey about his income, which he ‘banked’ in his back trouser pocket in the form of a large roll of beautiful green pound notes, each one fully able to fulfil K.O. Peppiatt’s promise to pay the bearer the sum of one pound on demand. It later turned out, after a burglary of the flat over the shop, that he had an alternative cache. His loss was said to be a fortune, as much even as £1,400.

This was an unimaginable sum to me, as I was then receiving one pound ten shillings per week, of which my mother relieved me of one pound two shillings. This left eight shillings, which was more than I was allowed from the errand boy's pay, but since I no longer received tips I was in much the same financial position.

BICYCLES

My principal recreation was bicycling. I had tried boxing but had soon lost interest. I wasn't aggressive enough to beat up my opponent who, misunderstanding my motives, beat me up instead. I also noticed that it was an extraordinarily unconstructive, even destructive, occupation, and the only professional boxer I knew looked a very old forty-year-old. I was very slightly hesitant about giving up the noble art, because my best friend, Peter Sbardella (some years later my brother-in-law) was a wonderfully quick and deft boxer, and I much admired his ability. I did knock him down once in training and was terrified that he would have his revenge and beat me up. But he didn't, and I have always remembered how pleased I was when we went home in friendship. I was prudent enough to realise, however, that one swallow does not make a summer, and that my future in boxing would be as a spectator. What I remember now with pleasure is how extraordinarily fit one can be at sixteen, without the chore of exercising!

My first bicycle was given to me in 1938 by Mrs Greening, a nurse who lived close by in an identical 'two and a box room up and two and a kitchen down'. While she shared the house with her twenty-year-old son, I shared mine with two adults and nine children. My parents occupied the best bedroom at the front of the house, I shared the box room with my two brothers, and my sisters shared three beds in the back bedroom. We had moved there in about 1936. It was on a large housing estate that I hated because I had grown to love the mysterious back alleys of Burnt Oak with their friendly shadows and their potential for an adventurous day's exploring and gleaning. In a housing estate there are no hiding places. The

neighbours could always see you, and report back if you were ‘up to something’.

A bicycle offered escape. I was never able fully to express to Mrs Greening my pleasure in her gift, for my mother was present when we dragged it out of the shed. It was in a bit of a state, but I imagined it repaired and polished, with me on it, swooping away from Shrewsbury Avenue and the 10,000 similar houses. I was especially thrilled because it was a BSA machine fitted with the fabulous derailleur gears. I explained that I could easily make the necessary repairs. Although I had never repaired a bicycle and had no suitable tools, I was in no doubt about my ability. I noticed my mother was looking displeased and I was anxious not to offend her. I knew that it was my eagerness to express my pleasure to Mrs Greening that was the cause for complaint. My mother could never understand why anyone kind or good should be appreciated. Good people she regarded with either suspicion or ridicule. To be kind was simply to be stupid. She began to point out how much work was needed to make the machine good, which was simply a ruse to devalue the gift and turn attention away from the giver. No doubt there was a way to thank darling Mrs Greening without offending my mother, but with only twelve years of parental contempt to draw on it wasn’t easy to find the words. So I showed my gratitude by dragging it into the open and running off with it to start on the repairs. Bicycles are simple enough machines, and I had friends whose fathers had bicycles, and bits of bicycles, and spanners, and it was soon on the road.

As the years progressed I traded the BSA for other lighter models, with more sporty features. This was always a part exchange, and I had to find some makeweight to add to my current machine. By 1941, the year I started my tyre treading course, I was the proud possessor of a lightweight sports racer which made a sixty-mile round trip a pleasant jaunt. Maidenhead was a favourite destination, and lunch was usually a dry sandwich and a glass of lemonade at Boulters Lock.

I cannot remember exactly which bicycle was involved, or the exact date, but once, during a particularly violent air raid, I lay in the

Anderson shelter while the bombs, directed by the ghostly parachute flares, fell around us, and the anti-aircraft guns fired in retaliation fit to rock us out of the ground, and offered a prayer for survival. This was because my latest bicycle was standing in the shed, and it would have been a huge disappointment if I did not survive long enough to test its performance. The prayer worked, and in due course the machine was traded for another, even faster model!

The best machines were handmade to the requirements of the rider. Their frame lugs and joints were exquisitely hand-finished by long established artists who were a cut above mere craftsmen. Each make had its style. Hetchins, my favourite, could have cost a million pounds for all my chances of owning one. It had elegantly curved rear-frame stays which, so far as I could see, offered absolutely no constructional merit whatever, although I was too much in love with their elegance ever to allow myself to consider this point. In fact, the idiosyncratic designs of Hetchins and several other makes were intended to make the machines easily recognisable in magazine photographs. The editors regarded it as free advertising if the name of the machine could be recognised. The makers simply made their machines easily recognisable whether or not the name could be seen and thus started the fashion for individual styles of construction. A friend of mine, Ken Pelling, was a few years older than me and possessed a Hetchins. Needless to say, he never lacked for friends who wanted to be seen with such a debonair and important owner. Alas, he was sent to France early in the war and was killed almost immediately upon landing. We were too shocked to enquire about the Hetchins, and it was never seen again. Perhaps he sold it before he went to France. He would not have told us, for fear of reducing his importance among those who could only stand and admire the sheer brilliance of being able to acquire such a glamorous machine.

Certainly, on only one pound ten shillings per week, I wasn’t going to be able to afford a Hetchins. Even changing my job wouldn’t increase my income sufficiently, for I imagined such a machine to cost twenty pounds or more. But the thought of an increased income

was attractive, for I would then be able to improve my own machine with better fittings.

APPRENTICE ELECTRICIAN

My friend Peter worked in company with his grandfather, a first generation Italian immigrant, and his uncle, at the Franco-British Electrical Company. I made enquiries and the work seemed promising. An electrical apprentice was needed and I was encouraged to apply. A visit to the factory proved very exciting. There were machines of every kind doing war work: they made mortar bombs, Mosquito landing gear, Spitfire ailerons and a variety of arc-welded components. I was taken on at two pounds per week and looked forward to building upon the electrical knowledge I had acquired with Soper. But I was to be disappointed. The electricians, dedicated members of their union, were very possessive of their skills, and I was only given the simplest of tasks. My work chiefly consisted of clambering up into the overhead shaft and pulleys that crowned every factory floor in those days, and lubricating the electric motors. This was done at lunchtime so that I wouldn't be sucked into the mass of leather belts that descended into the machines below. The pulley shafts also needed lubricating, but this was strictly the millwright apprentice's job. When, in all innocence and wanting only to please, I offered to oil the shafts while aloft, I was received in a shocked and offended manner, and the millwright sulked for two days before he relented sufficiently to ask me to pass the sugar at tea break. I also spent my time fixing up lengths of conduit ready to receive the wires for new or re-sited machinery, but here again I fell foul of an unspoken rule: only a limited amount of conduit could be fixed in one day. No one mentioned these rules, and the amount of work permitted was plainly absurd for the length of time allowed for it. Without any trouble that I can remember, I put up some 50 per cent more conduit than the code of work allowed, and this with a hammer and punch to drill the walls, for there were no hammer drills available then, or if there were, they were not allowed in the building.

It was made plain to me that my sort were traitors to the working man's cause, and that I was flying in the face of years of negotiated work arrangements designed to protect the worker from exploitation. The tragedy was that they were quite right. I had myself seen the 'working classes' toiling late into night and at weekends to make ends meet. Presumably, they were afraid to relax the conditions because although it made for a better war effort, it would disadvantage them at a later date. Occasionally this attitude was taken to absurd extremes, and workers would strike for shorter hours and more pay while their compatriots on active service were living a dangerous existence for a mere pittance.

I was instructed to join the union, but was quickly disillusioned. I attended the address I had been given and knocked on the door. A face appeared at a peep hole and enquired who I was. I told him, and he asked the inmates if I was to be allowed in. I entered and sat and listened to the business in hand. It was concerned with increasing the tea break from fifteen to twenty minutes. It wasn't very impressive. Workers could drink tea all day if they wanted to, from flasks which they brought to work with them, and there was no rule about smoking. Anyone who wanted to, smoked incessantly. The whole business was so ridiculous and so bogged down in pure emotionalism that one can only try and sympathise with them. At the time, however, I saw it as fecklessness and refused to join the union. I said I didn't understand what I had to do, and that I couldn't afford it. The matter was referred to the shop steward, and in due course the matter was raised again. I was told to join the union or leave. But because I was to be conscripted into the services before my apprenticeship could be completed, the matter was not pursued and I heard no more of it.

My time at Franco-British was quite undisciplined. I received no useful advice on electrical matters, and learnt almost nothing in the year or more spent with the firm. The work did not need the lathes or small machinery that I had enjoyed so much in the cinematography days, but the maintenance shop had a drill and bench vices, and I put these to work making cigarette lighters from scrap pieces of aluminium. It was useful work, for it developed my filing and general

hand skills. But although it kept me out of mischief, it did little for Franco-British, and nothing at all for the war effort.

The company occupied two buildings: one at Colindeep Lane, where the production machining was done, and the other on a private-access road running alongside Hendon Aerodrome, then equipped with Spitfires piloted by Poles. The latter was a new factory, the old one having been destroyed in a bombing raid, and produced air-frame parts. I was sent there for my remaining months as a civilian and assisted with electrical maintenance. The maintenance staff were not part of the production staff, and their output could not easily be assessed. They spent much of their time playing football on the roof. There were several electrical machines that interested me, but I was never allowed to investigate them and consequently I lost all interest in the work and followed the general trend of doing as little as possible in the maximum possible time. My bicycle received a lot of maintenance, and any spare money I had went on upgrading its equipment. The Hendon pilots were entertaining, especially the Poles, who practised the trick of getting airborne by raising the undercarriage when sufficient speed had been reached. We waited with excited anticipation for a misjudgement, but never saw one.

The war was then in full swing and the desert battles were holding everyone's attention. The mass bombers had been replaced by flying bombs, so the spectacular dog fights between German and British fighter planes had ceased.

For us youngsters, the word 'teenager' had not yet been coined. Life was tranquil enough as we approached conscription age. We spent our spare time cycling, boxing (not too fiercely on my part) and generally loafing about at the youth club. My weekends were spent on long cycle rides with Peter. They were wonderful runs. There were almost no other vehicles, and we would have the whole road to ourselves. We simply rode down the centre in perfect safety. On one occasion we attempted a camping holiday, but it ended in disillusionment when, arriving in Bath after a 100-mile journey, we were unable to buy food. The queue for bread was so long that by the time we reached the head of the queue there was none left. We

were allowed to buy just two currant buns, and applied our remaining energy to cycling home again.

A CHANGE OF ADDRESS

During my last months with Soper, we moved to a council house in Edgware. I knew the area well and had fond memories of the little school house where my drawings had been rewarded with two halfpennies, and the coal yard, with its horses and hay loft.

I had been told the new address by my mother on the day of the move, just before I left for work. It was not a road I knew, but I was given some advice on how to find it. During the day the fog came down very thickly. At that time coal fires were still in general use and the smoke and fumes, combined with a heavy fog, could produce an evil atmosphere that burned the throat and lungs. The complete absence of any street-lighting, due to the blackout regulations, made moving about after dark difficult. Combined, the darkness and the black fog made travel almost impossible. To make matters worse, I had forgotten the address.

I set out before darkness fell, riding my bicycle very slowly and trying desperately to remember the address. I knew I had associated it with some familiar and easy to remember word, but just as one sometimes puts something in a safe place and forgets where it is, so I had mislaid my keyword. One of the dangers of proceeding in such a thick fog was following the kerb stones as a guide, turning a corner without realising it, and so, unwittingly, changing direction. Concentrating on this problem I eventually ran into the kerb and was pitched full length across the pavement, bumping my head on an advertising board. By the light of my lamp I read on the board the name of a film. I cannot now remember the title but the important word was ‘Berlin’. This was my related memory word for Merlin, the name of the road I was heading for. And, of course, the number of the house was 110, the same as the old one. Now I had only to find my way there. It was fast becoming dark, and visibility was zero. I walked the bicycle along for a full half-hour in what I believed to be

the correct direction. The darkness was complete. My lamp lit only a small area in front of me. I could make out the kerb but had no idea in what direction it was taking me. Then the lamp went out, probably as a result of damage in the fall. It was now quite black, and the all-enveloping, pressing darkness was made worse by the total suppression of sounds of life by the fog. I began to feel apprehensive about my chances of making home, especially as I hadn't seen it before. Then, after a further hour, I sensed a familiar vibration. It was the aluminium smelting works on the road leading to Edgware. I headed in that direction, and in a little while saw the glow from the chimneys, and my confidence began to return. Had I taken a wrong turning before then, I could have spent the night walking miles of deserted road out towards Stanmore. Armed with advice from the factory guards, I eventually found Merlin Crescent at 10.30 in the evening. I had been walking in the dark for six hours, and covered only five miles. Fortunately there were no vehicles on the road and I had not been in much danger, but a night out in such evil conditions could do no one any good. The last such fog, in 1952, was eased by street lighting, but it was still responsible for the deaths of hundreds of people in the London area and brought about the Clean Air Act a year later.

ARMY TRAINING

In August 1944 I received my conscription papers. I was directed to attend the local Territorial Hall for a medical. I passed as A1, and was sent to Scotland for basic army training. For the first time in my life I had a bed to myself and a full outfit of clothes. Civilian clothes were not allowed, and so I bundled up my single suit and one decent shirt and sent them home. Always seeking to gain the affection and support of my mother, and knowing her constant need for money, I wrote a note to say that she could sell them. There was no reply, and I never saw the suit again.

After six weeks of foot drill, and instruction in how to point the correct end of a rifle at the enemy, all several hundred of us were

considered fit to be absorbed into the various branches of the army. To be suddenly transplanted 400 miles from home among a mass of strange faces gives one quite a lot to think about. Because I had always been self-sufficient, and preoccupied with my own interests, I made no friends, and cannot even remember any of their names. Compared to the others I was a simple-minded adolescent. I didn't know any of the dodges for scrounging out of duties, and so often found myself doing menial fatigues such as peeling potatoes. I didn't drink beer, and couldn't play cards, so was of no interest socially. Not that I was in the least bit bothered about this. In fact, I preferred my own company. As a twelve-year-old I had acquired a mouth organ and had learnt to play it by trying notes up and down the scale until I had pieced together the tune I wanted. My Scottish sojourn was an excellent opportunity to practice, especially at weekends, when the barrack room was empty.

The noise attracted the attention of one Sergeant Harris, a genial man with a great sense of fun who loved amateur theatricals. He was putting on a concert party to entertain the barracks, and suggested that I took part with my mouth organ. I hadn't sufficient confidence in my ability, and demurred. So he ordered me to participate, and I was left with no alternative. As things turned out, however, my contribution worked well. Almost every undistinguished rookie believes he could play the mouth organ well if only he could be bothered to take it up, and by playing such tunes as 'Lily Marlene' and 'Home Sweet Home' one can reduce the audience to such a state of nostalgia that even a wrong note is forgiven. I was so elated by the success of my first public performance that I felt a celebratory glass of beer was in order. I had seen several crates of it in the wings, put there by the experienced Sergeant Harris, who knew the beneficial effects of beer upon the nervous performer. I myself had witnessed how it had assisted a ballad singer to reach the high C that concluded his song. He had practised this leap three times in rehearsal, and missed it once. He expressed diffidence about his ability to strike it before an audience, when he was a little parched by nerves, and upon Sergeant Harris's orders he consumed the best part of a pint of beer before going on. He struck his note as true as

could be, to the delight of the audience, who stamped and whistled to express their appreciation of such an unexpected result. Unfortunately for me, my adolescent mind wasn't up to knowing that freely available beer wasn't likely to see out the length of the show, and sure enough only the empty crate remained. It was to be another two years before I was to drink.

My time in Scotland passed almost without incident, and I found army life undemanding and comfortable. Three meals a day and a warm bed were a new experience for me, so I had nothing to complain about. Rising at six o'clock and being on parade by six thirty was no problem, and to an eighteen-year-old hard physical exercise brings a feeling of great well-being. My only temporary discomforts were a bit of a sprain from leaping off a high wall, and two days in sickbay with a raging temperature after being vaccinated. Both were an irritation, because there was so much to learn and time off was time lost.

After training I was allowed seven days' leave. This was a singularly unexciting event. Like my contemporaries, I had been conscripted young, so we only had parents to visit. My leave pay of thirteen shillings needed to be carefully conserved if it was to get me through the week, and I was once again sharing a bed with my brother. I remember nothing of my parents; it was as if they had not been there. It was a relief to be on the train again, back to a more congenial life.

I was four minutes late returning to barracks, simply because my train was late arriving in Glasgow and I had missed my connection. As a consequence I was charged with absence without leave and delivered up to the company commander the next morning. In all innocence I explained the reason for my lateness, confident that it was a perfectly reasonable excuse. But to my discomfort it was pointed out to me that a seven-day leave means that one has six days to get back to barracks. No excuses were acceptable. I got my first seven days confined to barracks, and learnt a lesson in assessing priorities.

Having completed basic training, I was passed out and sent to Shropshire for further training as a mortar bomber. The weather was

beautiful, and the fresh green countryside made a pleasant change from the blue-grey heather of Scotland. First I was taught to drive a fifteen-hundredweight truck, then I was transferred to Bren carriers – small, tracked vehicles which transported the mortars. The training was hard and laborious. A regular basic exercise was a twenty-mile march carrying a dismantled mortar and its bombs. These were divided up into 18 kg lots for each man. Then there were field training exercises, which entailed manoeuvres over rough country with the carriers. Our lack of experience, combined with excited enthusiasm for our tasks, often led to accidents and sometimes to hilarious situations, the humour of which always seemed to escape our staff instructor. On one occasion, my carrier somehow slipped sideways into a hollow in the river we were crossing. The impact was sufficient to damage it so that the gears would not engage, and it had to be towed free with another carrier. They were equipped with hooks especially for this purpose, and the instructor explained that this mishap was a useful introduction to rescuing a vehicle. He ordered another carrier to back up to mine and, standing with one foot on each, demonstrated how to attach the chains. The noise from the engines made his shouted instructions difficult to hear, so that the tow driver misunderstood (at any rate, he said he did) and moved off smartly, dropping the instructor into the watery gap between the two vehicles. It is on occasions such as this that the fluency of instructional invective is best demonstrated, and we received the full repertoire. In addition, we were charged with insubordinate behaviour, simply because we found it difficult not to laugh, and I got a second dose of confined to barracks. I was of course totally innocent, but try telling that to a sodden sergeant fifty miles from a change of clothing.

From Shropshire I was sent to Yorkshire to train in the East Yorkshire Regiment. I arrived at a camp on the Yorkshire moors, close to Richmond, late on a bitterly cold January day. A freezing east wind blew fiercely around the Nissen huts which were our sleeping quarters. The huts had not been occupied for some days, and their interiors were as coldly unwelcoming as their exteriors.

Eight weeks' training in a Yorkshire winter was not an attractive proposition.

The training consisted mainly of field exercises that put to combat use the skills we had learnt in basic training. I was now a mortar man, and learnt how to make the enemy feel uncomfortable without actually coming into contact with him. We covered huge areas of the moors, mostly on foot, and usually marched a hundred miles in five days. At night, when we weren't walking, we slept on the ground. As this was covered with snow up to sixty centimetres thick, it wasn't particularly comfortable. But it was all part of a more adventurous life totally apart from civilian existence, and when we returned to barracks after each exercise I enjoyed greater comfort than I had known as a civilian in a house with eleven children sharing two bedrooms.

A FARMING EXPERIENCE

The hard training completed, we were put out to grass for a few weeks to wait for our postings. To assist with the war effort we were lent out in small groups to local farmers. Our task was to help with general farming in the absence of the labourers who, presumably, were away in uniform somewhere. The Yorkshireman has something of a reputation for being careful with his brass, a trait especially well-developed in the farmer, who needed to work long hours for what, he maintained, was a small return. On our first day we built a haystack, to the evident satisfaction of the farmer, who did his best not to sound grateful. We were paid nothing for our labour. If he had paid the six of us a shilling each we could each have bought a packet of cigarettes, and he would have had his haystack for only six shillings.

We were collected by truck in the evening and returned to camp for supper. Asked by the platoon sergeant how we had fared, we explained how disappointed we were at having worked for ten hours work for no pay. The next morning, we piled into the truck and were taken to the same farm. Our friendly sergeant told us to mooch about looking disconsolate and bored, while he explained to the farmer that

we were disinclined to be cooperative because we had worked long hours for no reward. As he left, our sergeant assured us that all would be well so long as we put in a good day's work and, sure enough, when we were picked up in the evening we each received a shilling's pay and returned to camp in good spirits. A shilling would buy ten cigarettes and a plate of sausages and eggs in the NAAFI; what better reward could one have for ten hours' exercise in the open air?

Tractors were not common in the 1940s, and most farms relied on horses for draught work. Our farmer had two mighty shire horses with hooves the size of dinner plates. Being a Londoner I was familiar only with the float horses used for delivering milk, and the somewhat larger breed used by brewers and coal merchants. Neither compared with the horses I met in Yorkshire, and I felt slightly apprehensive in their presence. On the day we were to gather the hay the two horses were backed into the traces of a cart, an ungainly process, it seemed to me, and completed with little goodwill on the part of the horses. When all was ready I was instructed, to my astonished consternation, to take the outfit into the field. I had no idea how to handle a horse, let alone a complete carrier's assembly, unless it would respond to the 'Gee up!' which seemed to work with milk cart horses. I grasped the halter of one horse with as much confidence as I could muster and, deeply conscious of my mates being ready to jeer if I failed, gave the command 'Gee up!' As I said it, I wondered how on earth I was going to stop it again. But I needn't have worried, for my horse had assessed my capability the moment I had spoken and demonstrated his contempt by lying down in the traces. He didn't fall because he wasn't moving. He simply went down on his knees and rolled over. Everyone except the farmer and I thought this was terribly funny. I suppose I should have felt some embarrassment at my failure to manage the affair, but I didn't really care. I didn't like horses, and they clearly didn't think much of me. I was prepared to settle for that for the rest of my life. Getting the horse back on its feet was a chaotic business as it was tangled up in the leather straps, and we couldn't loosen them because the horse lay on the buckles. It flailed

its hind legs in a terrifying manner, and would have decapitated anyone who got in the way. To my fear and astonishment the farmer told me to hold its leg down while he reached out for the buckles. By now I had had enough of horses, and I invited him to show me how to catch it and hold it, but he decided to manage without me. When the horses were finally back in harness they followed their owner without a trace of bad temper.

That evening the horses were back in the stalls, and I was told to fill their feeding boxes. As I walked past the same horse that had discomfited me earlier it suddenly leant towards me and trapped me against the wall. I knew I should be injured if this monstrous animal pushed against me, as it was obviously intent on doing. It goes without saying that I was frightened of it, but I certainly wasn't going to be humiliated by it. In some desperation I jabbed the point of the pitchfork into its rump. It screamed with surprise and threw its hind quarters into the air, flailing out with its hooves. As it landed with the weight on its feet instead of on me, I slipped sideways and out of harm's way. The farmer made a fuss, claiming that I had deliberately injured his horse. I never denied it, but insisted that it had been either me or the horse. To settle things, I was moved to another farm, but within a few weeks I was posted to the Middle East where, in 1945, I joined the 2nd Battalion The East Yorkshire Regiment.

GENTLE SERVICE IN THE MIDDLE EAST

The journey to Egypt was made in the bomb bay of a modified American Liberator bomber. We sat in two facing rows, with so little room that our knees were interwoven. It was my first flight and very exciting. Our altitude was so low that we could clearly make out people and animals below, and our path over Brighton, the Channel and France was an enjoyable and interesting experience. We landed at Marseilles and remained there for three days while repairs were made to one of the engines. From there we flew to Cairo. The contrast between the cold interior of the aeroplane, with its roaring, clattering engines, and the heat and silence of the desert landing

strip was very dramatic. All around us were pyramids, camels, Arabs, and Egyptian labourers quietly grinding sandstone blocks by hand for building. A native ran by, wearing what were obviously new army boots. There were vendors of fruit, watches, sweets, Coca-Cola and melons. A laundry was fully engaged washing and pressing suits, shirts and underclothes. The ironers starched the shirts and shorts by taking a mouthful of starched water and skilfully blowing it in an even spray over the garment to be ironed. Everywhere there were tents for eating in, sleeping in and meeting in. During the day the heat was intense and inescapable. At night it was intensely cold. There could be no greater contrast than between Yorkshire and Egypt, and no doubt there would be a lot to learn. We left at 0600 hours the following morning and travelled by open truck to our regiment at Moascar.

Life with the 2nd Battalion was rather dull, and consisted mainly of physical training and drill parades. One day, having better things to do, I neglected to turn out for PT and remained behind to play with a watch that needed some attention. Without any warning the Company Sergeant Major appeared in the doorway and spotted me huddled over my watch. ‘Is your name Daniels?’ he demanded. ‘Yes, sir,’ I replied in confusion. ‘Right, Daniels, the CO wants to see you now.’ Fearing the worst, I hurried to the CO’s office tent. I made my way in and gave my best salute, ‘Private Daniels reporting, sir!’

‘Ah, Daniels!’ he said, ‘I understand you can type?’

‘Yes, sir,’ I replied, slightly puzzled, as the only typewriter I had ever seen was the venerable Remington in my old headmaster’s office.

‘Very well, Daniels, report here at 0900 tomorrow.’ I got there at 0800 and tried out the typewriter, which gave me no problems, and so when the CO arrived at 0900 I was fully practised and proficient! Thus for the second time in my life I had escaped from boredom to something more interesting. I must confess, however, that this second escape owed more to luck than the first.

So it was that I became company clerk to Captain Bill Simpson and enjoyed a happy and instructive one and a half years away from PT, drill and guard duty. Then, in early 1947, the company

commander was demobbed and a rather effeminate captain took his place. We took an instant dislike to each other, and I was sacked. Anxious to avoid the drill parades and general duties, I was delighted to discover that the medical officer's clerk was also leaving, and so I presented myself and was accepted for the post. The duties were simpler than the company clerk's. They consisted mainly of organising sick parade for the medical officer. I was free every weekend, and went swimming in the Suez Canal. The only emergency we had in twelve months was the urgent inoculation of the whole battalion against an outbreak of cholera. Some 1,050 inoculations were given with the same syringe and needle!

During this period, we moved at various times to Tel Aviv, Haifa and Beirut, where our duties were to supervise immigration to Israel. It was not a very arduous task, so long as one took precautions against being a target for those who objected to our presence. The greatest danger was the possibility of being kidnapped and held as hostage against the release of imprisoned terrorists. Since the prisoners, or whatever the bargaining coin was, were never surrendered, the fate of the kidnapped was likely to be torture and death by mutilation. As is so often the case, the British forces were not wanted. They were saving political face and acting within the Geneva Convention against a foe they could not recognise, a foe who attacked relentlessly, and without a code of conduct to prevent brutality. Most of the so-called terrorists are now dead or living quietly as respectable senior citizens. Some are still serving their community in more peaceful ways. Some have held high office and engaged with their 'enemies' in constructive discussions.

But these events occurred over fifty years ago, and looking back one remembers more willingly the sunshine, the swimming, the freedom from responsibility and the companionship.

Watches were, once again, an obsession. I had rigged up a small workbench in my quarters, and repaired watches, cameras and typewriters for members of the battalion. In this way I augmented my income, and was able to save while not drawing pay. I had no clear idea why I was saving, but I knew that my future was not in the services and that a nest egg would be useful. This is not to say that I

did not enjoy my service days. Indeed, I remember them with great pleasure and gratitude. Between August 1944 and October 1947 I learnt to believe in myself and have confidence in my ambitions. As a clerk I had ample opportunity to study the ‘officer class’ and assimilate a positive and intelligent approach to day-to-day problems. I could understand an intelligence report and, more usefully, write one, in clear English. I no longer spoke with a cockney accent, simply because at that time an accent was a bar to progress. I wasn’t sure where I wanted to go, and kept my options open.

I was much wiser when I finished my military service. I had also enjoyed being physically fit, free from domestic responsibilities, and seen a thousand different sights as I travelled the world.

ENCOUNTER WITH A WATCHMAKER

I returned home to a war-bankrupted, bitterly cold England. For the first two weeks I lived at home, but conditions there were no better than they had been when I left three years earlier. The family was getting smaller as members left under the pressure of my mother’s bad-tempered avarice and my father’s foul language. Not that I was much concerned about that, since there was no family affection among us. I simply left as soon as I could get organised.

I was then twenty-one years and three months old, and very naive. I had my army gratuity and the pay I had saved for over a year and a half. There had been nothing to spend it on in the desert, and I didn’t drink. My sole ambition was to become a watchmaker. It never occurred to me that mending watches for friends was not the same as earning a living from it. I was not shackled by convention, and my belief in my ability left me in no doubt that I would succeed. Most importantly, I had some fifty pounds in cash, no responsibilities, and no debts.

In 1946 I had gone home to England on leave. Needing a new watch strap, I visited Magill’s Jewellers in Edgware. The watchmaker employed in the shop had just been demobbed, and so we fell easily into conversation. He asked who had made the complex-shaped

glass and the winding crown for my watch. I explained that there were many spare hours in the desert which could be turned to useful account, and that watchmaking was my hobby. He showed great interest and suggested I visit him again when I was demobbed. My early reading of books on horology stood me in good stead and he was impressed with my knowledge. Unfortunately my practical ability was still very amateurish, but that was not something to be concerned with at that moment, and our conversation greatly increased my confidence.

Now, anxious to start work, I bought a bicycle as a ready means of transport and presented myself to my watchmaker friend. He was as good as his word and gave me a job. It was a signal moment in my life – at last I was occupied professionally as a watchmaker. From then on the watch dominated my life.

I was very lucky to get this position, for it turned out that Mrs Magill, the proprietor, had been keeping it for her son, who was still in the services. But as he was going to be absent for another twelve months, I was allowed to keep the position. Had it not been for these small details, I might have found it necessary to take up my earlier life as a mechanic or electrician, with quite different consequences.

My watchmaker friend, James Buttle, soon discovered my lack of professional experience, but he was a persevering and kindly instructor, and my skills soon improved. My pay was only three pounds per week, so not too much was expected from me. My lodgings were with dear elderly May and Jack, who lived together ‘in sin’. The rent was two pounds ten shillings per week, and so I had to be rather frugal, but it was a small, congenial household (another ‘two and a box room up and two and a kitchen down’) and life was pleasant, well-organised and comfortable. I would leave in the morning after a well-prepared breakfast, and when I returned in the evening dinner would be ready. It was served in the dining room, with the tablecloth, napkins and cutlery all neatly laid out.

Laundry was included in the rent, and hot water was available for baths. The purchase of a ten-year-old Bakelite-cased Ecko radio for one pound ten shillings, half its original price, completed the

comfort of my room. I was very happy, it was my first experience of those home comforts that most people take for granted.

The one other lodger, A.C. ‘Tony’ Packe, was slim, had piercing dark eyes, and spoke with a carefully modulated BBC accent. He would gently mock my obvious want of education and social confidence, and worked as a designer of some sort at de Havilland’s aircraft factory. Mathematics was his strong point, but when I asked him a question on this subject his answers were so elaborate that I became confused and gave up trying to pick his brains. He loved sailing, and kept a small boat on Birdham Canal, near Chichester. Sometimes I went with him. Sailing had no appeal for me but at least it made for an interesting weekend. We would travel down by Southern Railway, and he would describe in his loud, confident, beautifully rounded accent the interesting features of the countryside we passed through. I found it slightly embarrassing, mainly, I think, because it directed the attention of other passengers on to me and my presumed (actual) ignorance. The berths for the boats on the canal were without facilities of any sort, and conditions were, to say the least, primitive. I found the sailing rather boring and slow, but it was a challenge to please Tony by sailing really close to the wind and looking proficient. He would stand by and wait for me to overreach, then grab the tiller with a masterful sweep of his arm and bring her round again. He must have enjoyed it, or he wouldn’t have let me steer so often! When one sees how congested with small boats the area is now, it is hard to believe that often we were the only boat in Chichester harbour, sailing cold, wet and lonely voyages on a Sunday afternoon.

Tony’s other occupation was playing the cello in the City Literary Orchestra. When practising at our digs he would hand me a violin and explain that I was to play the melody and he would practice the cello part. I had never even held a violin before, let alone played one, and I would persuade him to play the melody to me so that I could play it back from memory on one string of the violin. He seemed to find it enjoyable and useful, not the least reason being, I think, that he could once again demonstrate a talent that I did not share. But his carefully contained disdain for me was unimportant. He helped to

increase my social confidence, and made me aware of a world outside my own parochial, self-centred interests. I suspect that much of his general attitude was contrived to increase his own self-confidence, but I enjoyed measuring myself against him, and genuinely admired his accomplishments.

May Williams, whose house we occupied, was small, frail, hard-working and Welsh. She had spent many years working as a Lyons Corner House manageress, and was most fastidious in her habits and housekeeping. Her first concern always was for the comfort of her paying guests. Jack (I never knew his surname) could never quite comprehend the world about him. He spent his days selling barbers' accessories, which he carried around in a small case.

My army savings now became very useful. I bought tools to assist with my work, and a bicycle for the weekends and summer evenings. It was a hand-built Hetchins, a gross extravagance but the fulfilment of my teenage ambition. It had cost me forty-two pounds, when a more common machine would have cost only fifteen pounds, but it is always a special pleasure to have the best, even when it is only a bicycle. At that time the roads, like the coastline, were almost deserted, and the Hetchins gave me great pleasure. It was good exercise, there were no running costs, and was a means of travelling without expense.

During one of my bicycle runs I came across a jeweller's shop in Aylesbury bearing the legend 'J. Richards, FBHI, Watchmaker'. I asked James Buttle, now known to me as 'Jimmy', what these letters meant. 'Fellow of the British Horological Institute' was the answer. It sounded like a step I had to take. The result: an interview for a place at Northampton Polytechnic horological classes at a cost of one pound sixteen shillings per year for the three-year course. My application was accepted, and I started the course in September 1949. I had to attend class three evenings per week and there was homework to do every weekend. But I was twenty-three years old and obsessed with the desire to improve myself, so I barely noticed the travel and the work required to maintain my position in class. After work every Monday, Wednesday and Friday I would cycle to the digs, bolt down my dinner and then set off at a trot to catch the

tube train from Edgware to the Angel. The college was a mile or so's walk from there. Classes started at 7.00 p.m. and finished at 9.30 p.m., then it was back to the tube train and Edgware. One of my classmates also lived at Edgware, so we travelled together. Apart from the companionship, it was very useful to compare thoughts on the evening's work, and to test each other's understanding. I really was taking evening classes very seriously and was all too aware of my lack of mathematical agility. For physical competition we ran up and down the several flights of stairs at the college, and made a point of running up descending escalators in the tube stations. This had to be done in one swift and continuous motion, the slightest hesitation would start to take you backwards. What with this and cycling, I could boast a very strong pair of legs! On the way home we skipped down ascending escalators. This needed great concentration rather than strength, and very nimble footwork.

I spent my Saturdays in London with a new friend, Peter Hamdorf. First we would visit Foyles in Charing Cross Road and enquire after second-hand horological books. My thirst for horological knowledge became an obsession. I purchased every available book and studied every word in my mind's eye in order to follow the processes described. Sometimes the sequence of events was not convincing, but then I was not very experienced. Even so, I formed the impression that much was written by writers with no practical experience, who took advice from practical men who could not express themselves clearly. The evening classes were not as advanced as the books claimed to be, so I was left in some confusion. When I wrote my own treatise on watchmaking thirty-five years later, I was careful only to include practical facts and first-hand experience.

In the evening Peter and I would visit the theatre or the opera. Standing in the gods at Covent Garden could cost as little as a shilling, and a seat, if available, cost only two shillings. For this, one could enjoy such unique occasions as *Boris Godunov* sung by Boris Christoff, *Salome* with the dancing Ljuba Welitsch entangled in her seven veils, and a scenario by Salvador Dalí.

I had met Peter at a party. Like me, he was just out of the services and looking to make his way in the world. We struck up a friendship that lasted many years. Always looking for entertainment on a Saturday, we had elected to go to Sadler's Wells Opera. Neither of us had been to an opera before. We sat in the stalls to hear *Faust* for the first time. It was bitingly cold in the auditorium, and after the first interval many people returned to their seats wearing overcoats and scarves. But none of this was important when compared to the music and the beautiful sounds of the orchestra and performers. We had overwhelmingly discovered what to do on Saturday evenings. And so it was that we attended the opera at every available opportunity and heard all the great singers of the Forties, Fifties and Sixties. The theatre might be Covent Garden, Sadler's Wells or the Stoll, but we always concluded with supper in St Giles High Street Cafe where we consumed *bœuf à cheval* and chips for one shilling before returning home by the underground. Occasionally our money would run out and we had to walk the ten miles back home to Edgware, arriving at between three and four o'clock in the morning.

Sunday was cycling day, whatever the weather. A favourite run was to Boulters Lock at Maidenhead, which was seventy miles there and back. We always planned to be back in Edgware in time for a pint of beer in the Green Man, where I would do my homework.

Under Jimmy's guidance I learnt the essential requirements of watch and clock cleaning and overhauling. I became experienced in making small components to replace worn or damaged pieces. Such work was not commercially encouraged, as it was time consuming and expensive, especially when the workshop, a small room at the back, was not suitably equipped for such noisy work. Whenever possible I would make components, simply for the satisfaction of improving the performance of an inferior watch. The variety of work gave me a broad experience in a relatively short time, particularly in assessing the quality and finish of movements, and I began to formulate my own professional standards for the future.

MAKING PROGRESS

I had a natural appreciation of the laws of mechanics, and coped easily with practical work. In fact, by 1949 I was routinely undertaking more complex tasks. I had then moved to another position in Hendon as a qualified watchmaker.

It will be remembered that I was receiving only three pounds per week at Magill's, and I had soon reached the stage where I was obliged to sell my watch to cover my expenses. A change of position was needed, especially now that I was feeling more confident and my employer's son would soon be returning from the services. It was, therefore, a stroke of good fortune to be told that a better local position was available. There were in fact several jobs to be had in London at that time. All watches were mechanical, and new watches were scarce, so repairers, who also were in short supply, were much in demand.

I attended my prospective employer's shop and discussed with him the prospects of employment. He asked me what could I do. I confidently assured him that I could do anything he wanted. Furthermore, I had a complete set of tools including something he did not possess, a lathe, bought with the last of my army gratuity. He seemed very pleased with my answers and asked me what salary I wanted. This was the time to strike. I said I had been offered a position for eight pounds per week, and wouldn't take less. He immediately suggested nine pounds per week. I was so taken aback by the speed of his response that for a moment I was speechless. Misinterpreting this as hesitation on my part, he said, 'Well, what about another ten shillings' travelling expenses?'

With my new-found wealth I indulged myself in badly-needed clothes and footwear. My friend Peter, who enjoyed relaxation more than I did, proposed a motorbike. I bought one at two pounds per week on hire purchase, and used it for commuting as well as for weekend trips with Peter on the back bracket. Such swift travel brought an end to my cycling days, and I sold my beautiful Hetchins bicycle. But I have never forgotten it, and in 1980 purchased another from the son of the maker of my first one. It is still a pleasure to ride a first-class, handmade bicycle.

As for my new employment, I found plenty to occupy myself. The shelves of the shop were littered with trays of dismantled watches which my employer could not cope with. My task was to put them back into working order for the benefit of their owners. It was a wonderful experience, and took some twelve to fourteen months to complete. Then I felt it was time for another move.

Jimmy Buttle had left Magill's and started on his own as a trade repairer. His workshop was a spare room in his mother's Victorian house in Thornton Heath, near Croydon. Once he was established he contacted me and invited me to join him. Feeling that I had learnt all I could at Hendon I was pleased to do so. I must say I didn't pay much attention to the details and forgot to ask what the pay would be. This turned out to be less than I had received at Hendon, but the promise of a partnership in due course was exciting enough to make that unimportant.

A trade watch repairer attends to watches for shopkeepers, who then add their margin before charging their customers for the repair. As a consequence, the repairer's charges are restricted, and he must do twice as much work as he would if he worked directly for the public (although, in his favour, he avoids the time-consuming business of dealing with individuals). A successful trade worker is therefore a very busy man, and we certainly worked very hard indeed. I was paid according to what I produced, and so had to put in long hours to maintain my income. My motorbike became vital for my journeys to evening classes, and in order to have the necessary free time for the three classes per week I was sometimes obliged to work all night upon my return home. It was necessary to deliver the work to the shop-keeper early in the day so that he could fulfil his promise to his customers. It was an obligation upon which everyone's success depended, and was always fulfilled.

I worked like this until 1956, when I left Jimmy Buttle to start up on my own. For the previous year things had gone badly. Jimmy was neglecting his responsibilities and had grown fond of the drink. After continuing to do the work alone for a month with no pay I concluded that I would not, as I had hoped, get a partnership. I had to think again, and quickly, for I had run out of money.

STARTING TO WORK ALONE

I had finished the evening classes three years earlier. In 1953 I had passed my final examinations, was awarded the Skinners Prize, and became a fellow of the Horological Institute. I collected the certificate from the then Astronomer Royal, Sir Harold Spencer-Jones. It was a slightly embarrassing occasion. I had journeyed up to the Royal Society of Arts on the motorbike. It was a very wet night, and I was wearing some cumbersome anti-gas attack boots bought from ex-War Department Supplies, simply because I could not afford the proper wet-weather clothes. And because I could not get them on while wearing shoes, I had put on a pair of bedroom slippers. When I got to London, I found I had left my shoes at home. I was therefore obliged to clamber up onto the platform with my knees slightly bent so that the trouser cuffs would partly conceal the slippers. They were never mentioned!

I was working such long hours that I was pleased to have finished with my three-times-a-week journey, made on the motorbike at night and in all weathers. I was proud of my new certificate, but the real benefit was the confidence I got from knowing that I had been examined on every known aspect of the science of watches. I had no doubt about my ability to master the subject.

During the course I had several times expressed a wish to accomplish something more than the required practical work. Indeed, as a practising watch repairer, I was well in advance of the syllabus. On one occasion during the second year I completed in one evening the whole of the exercise for the first half term. To my astonishment, the instructor, himself a practising watchmaker, declared that the work was too good and too quick to have been done by me, and that a skilled worker from outside had done it for me. But by the greatest good fortune both his assistant and a classmate had seen me work from beginning to end, and so the matter was settled. I received no apology, however, and the instructor and I were, ever after, indifferent to each other. I was never

allowed to make the chronometer I wanted, and so finished off each session by making tools for myself.

It was at a lunch party given by the British Horological Institute in honour of a visit of Dr A.L. Rawlings, the celebrated author of *The Science of Clocks and Watches*, that I met Frank Mercer, the irascible and strongly opinionated head of the chronometer company, Thomas Mercer of Saint Albans. I plucked up the courage to introduce myself to him, which was like a stranger introducing himself to the Pope. But he said that I could speak to him after the lunch. This I did, and I told him that I wanted to make a marine chronometer, to me at that time the ultimate manufacturing exercise. I felt that under his bullishness he was a kindly man, and so he turned out to be. He invited me to visit his factory, introduced me to his family, and subsequently sold me a set of components for fifty pounds from which I could manufacture the chronometer. Six months later, with the machine completed and rated, I returned to receive his approval. Fortunately, I had brought a bottle of brandy to cement our relationship, and we remained on friendly terms until his death in 1970.

In starting my own repair business I had two difficulties to overcome. The first was a shortage of money; the second, a complete lack of work. Neither was a cause for worry, however, for I had been careful not to owe money and had no dependants. My regular debts were the rent of my flat, two pounds ten shillings per week and eight pounds per month for a Scottish Widows pension.

I was thirty years old and somewhat bored with watch-repairing. I needed a new interest, and even considered a job as an air steward as a means of travelling and seeing more of the world outside South Norwood in the London Borough of Croydon, where I now lived.

To satisfy my immediate needs I applied to various houses for work and found enough to keep the wolf from the door. Watch houses and shopkeepers are apprehensive of watchmakers they don’t know, and so good work is hard to find. For the first few months I worked solely on repairs from material houses. This was a last resort, for most the watches were of a very poor quality. In my

opinion, some of the watches were not worth repairing, and I soon discovered that the houses agreed with me. They were then able to sell the owner another with a clear conscience. My refusal to work on poor quality watches had a beneficial effect, it brought me the offer of better work and so increased my earnings. These were necessary for expenditure on an old motor car I had bought a year earlier for recreation.

FIRST BENTLEY, PD 3211 – AN ACCIDENTAL PURCHASE

In the years 1953–56 I had tried various cars, all bought on hire purchase, but had found none to be of lasting interest. Then one day I was accosted in the street by an ex-Ambrose's orchestra trumpet player, who has lost all his teeth and turned to car dealing. He had encouraged me to buy a car from him several times, but always without success. Now, once again, he turned on his sales chatter, and in a bid to discourage him for ever I declared that I was resolved to buy a vintage Bentley, the sort of car that he would never have for sale. To my discomfort, however, he said that he had just such a car. I had no wish to own one, and had chosen it simply because I had seen one a few days earlier and it had sprung to mind as a suitable discouragement. But there was no alternative, I had to go with him to his shop to see it. It stood in his back yard, a vast saloon with a crumpled bonnet lying on the back seat. I walked round and round the car, noting the quality of the faded upholstery, the silver and ivory fittings and, in the dash pocket, the original handbook, sales receipt and guarantee. The car was a 1924, long chassis, 3-litre Bentley, with landaulette coachwork by Gurney Nutting. It was all very sad and shabby, and I fell to imagining it in its heyday, when no doubt it was the smartest thing on the road and the envy of all.

My mentor saw my interest and weighed up his chances. 'It's yours for two hundred quid', he said. Seeing a way out of my difficulties, I turned with what I hoped was a disappointed expression and said, 'What a pity, I only have a hundred pounds.' In a flash he

thrust out his hand to grab mine as he exclaimed, ‘She’s yours!’ And so I reluctantly bought my first Bentley.

The restoration of the Bentley was occupying my mind and would need money. But the car vastly increased my circle of friends. Bentley owners were much more sociable than watch repairers, who seemed to take a very parochial and gloomy view of their profession. After ten full years practising as a watch repairer, I had not one social companion in the trade. Now that my thirst for knowledge was, for the moment, satisfied, I began to notice this deficiency.

Very soon after the purchase of the car it proved its usefulness by securing the tenancy of the flat that enabled me to move out of my lodgings. I had noticed the empty flat in South Norwood some days earlier and enquired about it at the agents. They assured me it was already taken and would be occupied soon. A month later it was still empty and I enquired again. It would soon be occupied, I was told. Soon after, I discovered the owners name and telephoned him. He was curious about me and asked what I did and what my interests were. We conversed for some minutes and he asked if I had motor car. I described my Bentley. ‘Excellent,’ he said, ‘I will let the flat to you if you will also rent an adjoining garage.’ His problem, apparently, was the Rent Restriction Act, which set a ceiling on the rent for the flat. A flat and garage combined, however, was exempt. We agreed a rent of two pounds ten shillings per week, which suited me very well. I set up my bench in the flat and was in business as a watch repairer with a Bentley in the garage!

The workshop was a Victorian roll-top desk in the corner of the living room. The hours were long – 7 a.m. to 9 p.m. – for the pay was low. High volume output was necessary.

I would deliver the work on Saturday mornings. Saturday afternoon was my only time away from the bench. At 1 p.m. I would switch on the electric blanket (there was no heating in the flat) and drive down to Lingfield in Surrey, where there would be several Bentley owners gathered at Lyne House Farm, the home of Grace and Geoffrey Jacobs. Their son, Michael, was a Bentley enthusiast and had bought a huge quantity of original Bentley spares from an ex-works mechanic. Naturally, he was very popular with Bentley

owners seeking spare parts. Because my car had so many windows it was quickly dubbed ‘the greenhouse’ and regarded with some amusement. But by vigorous use of the gear lever it could hold its own on the road against their touring models, and I didn’t get wet when it rained.

In the evening we would all stay for supper. There could be up to a dozen of us at table. The more we were, the more it pleased Geoffrey and Grace. After dinner we would drive a convoy of Bentleys to the pub in Chiddingstone where we whiled away the evening, sometimes to the irritation of the locals who had to park in the road.

Finally I returned to Lyne House for coffee, then set off for home and the comfort (especially in winter) of my electrically heated bed. The drive home, often in moonlight and on deserted roads, was a delightful way of ending the day.

The next morning I would be back at the workbench, and would remain there until the following Saturday afternoon.

4

WATCHES VERSUS BENTLEYS

Over the next four years my watch repairing business expanded and I could concentrate on better-quality work. In particular, I enjoyed good relations with the Omega Watch Company, who at that time produced high-grade watches of most practical and simple designs. I also collected work every week from two local shopkeepers. Summer was busier than the winter because watches frequently got damaged on holiday. So-called waterproof watches, for example, suffered badly from rust when they were immersed in the sea. There was an international rumpus about this in the 1950s, and standards for waterproofing were introduced. Most manufacturers then contented themselves with describing their cases as ‘water-resistant’ to avoid responsibility for water damage. At about the same time another row blew up, about the number of jewels in a watch. The jewels are the bearings for the pivots and axles of the rotating watch components. Usually made from sapphire, they are hard and durable, and keep wear of the components to a minimum. Fifteen jewels are sufficient for a manually wound watch, but cheap watches were fitted with only seven in the working parts; cheap, non-working jewels were then added to give the impression of better quality. This is no longer allowed. Modern watches with automatic winding often have as many as twenty-seven jewels, and all are an integral part of the designed mechanism and contribute to its reliability.

The art of trade repairing is to know what is essential, and what isn’t. Watches are quite different from clocks, which will run without attention for many years. Watches have to work harder, and suffer a

good deal of abuse from the wearer's daily exertions. Watches made before the 1970s, in particular, were exposed to greater wear as dirt would enter their non-hermetically sealed cases, especially those with inferior self-winding mechanisms. After repair the watch was guaranteed for twelve months, but the owner would still not be pleased if it gave trouble after this. If the repairer attended meticulously to every apparent or potential defect, then the cost of repair would be prohibitive, and the owner would object. So too would the shopkeeper, who had to deal with the customer. Thus one had to strike a balance between satisfying the owner, who was often very suspicious of the watch repairer, and maintaining one's reputation for reliability.

The work is uninspiring and certainly not creative, but it is congenial and satisfying enough, and, providing one knows when to stop, financially rewarding. The standard of living that young men expect today, however, has made it more difficult to start out as a watch repairer; the necessary skills and experience are not quickly acquired, and so it is uneconomical to employ these people. My task was made more difficult because I had become fascinated by the mechanics of my Bentley, and was finding it more interesting to repair than watches.

I had to develop a strict and disciplined programme of work to ensure that both tasks were equally attended to: four sixteen-hour days on the watches, then the rest of week on the Bentley. Watch days were Monday to Thursday, and the work was delivered on Friday afternoon. This gave me insufficient time to regulate the watches before delivery, however, so to speed up the process, which might need several adjustments in two or three days, I bought one of the expensive, new-fangled electronic timing machines. Without it the programme could never have worked.

Bentley days were Friday evening, Saturday and Sunday. In the summer a Bentley day would often start at 5 a.m. and run through to the late evening, when I would seek refreshment and food at the nearby pub. In between working on the car I would use it to go on outings with other Bentley owners.

Being large, long and heavy, my car didn't fit the sporting Bentley image, but, as I have said, with a little extra work at the gear lever I could keep up with my friends' more sporting models. It could also carry six people, and its roof protected us from bad weather. If the weather was good, we could open all six windows, the windscreen and the rear of the roof. My pet budgerigar, Henry, swung from the centre of the roof and had a wonderful time hopping from perch to perch while chattering incessantly to the noisy rattle of the engine. We made many enjoyable runs to the coast, the opera at Glyndebourne, and various motor rallies.

As the months went by I improved the car until the chassis, engine and running gear were in perfect condition. The engine, with its copper and brass fittings, gleamed with a finish far finer than its original condition. At last the time came to repaint and reupholster the coachwork. I started this in 1960, and finished it in time for the great annual Bentley meeting held in Kensington Gardens that June. Looking most beautiful in her new dark-green and black livery with fawn upholstery and pale-green carpet, she took the championship prize against some pretty serious competition. As a consequence she was given a place of honour in the ballroom of the Dorchester Hotel at the annual dinner dance of the Bentley Drivers' Club. The great W.O. Bentley himself was photographed sitting in her, and expressed his delight at her resurrection. It is worth mentioning that the Bentley Dorchester Dinner Dance was first held in 1927, after the famous victory of the Bentley sports cars at Le Mans, a twenty-four-hour event which they won five times during the 1920s.

In retrospect, I realise now that the restoration of so large and complex a motor car was a gigantic task for one man. It entailed stripping the engine, gearbox and axles from the chassis, dismantling them and then overhauling them to the new specification. In addition, the interior upholstery, head-lining and woodwork needed refurbishing, while all the dashboard instruments needed repairing, re-calibrating and finishing. Externally, the coachwork had to be repaired where necessary and repainted, and fittings such as door handles and window frames needed re-plating in the original nickel finish. With optimism, unproven confidence in

my inexperienced ability, and a pleasurable anticipation of the work to be done, I set to with a clear vision in my mind of what the finished car would look like.

The work took a whole year of Bentley days, starting at daylight in the winter and between 5 and 6 a.m. in the summer. In the winter evenings I would work by torchlight, while on summer days I would keep going until dusk. The garage was some six metres long but only two metres wide, so most of the work was done outside. With the engine removed, the rolling chassis had to be pushed in and out of the garage. On showery days I had to push it in and out several times. Under such circumstances the frequency of rain in England becomes indelibly impressed on the mind! Some of the garages were rented by my neighbours, not all of whom were sympathetic to my struggles. If the Bentley was outside without its wheels then they had to wait until the wheels were refitted and the car rolled into the garage before they could pass. But I was too obsessed with my passion to take heed of their complaints.

The main engine components were machined by a local engineer whose premises were attached to his house, a convenient means of making a living while contributing to the general prosperity of the neighbourhood that is no longer permitted. Planning rules, which are formulated to reduce all residential areas to uniform dwellings, give the impression that no one works for a living any more. But forty years ago, South London abounded with small workshops able to undertake every imaginable kind of work. Their proprietors were both jealous of their reputations and concerned for their customers' satisfaction. Thus specialist work such as welding, plating, stitching, machining, brake-and-clutch lining was accomplished simply and quickly.

Upon their return I polished the components and stored them in my bedroom, ready for reassembly. The reassembly of the engine, gearbox, axles, instruments and chassis components took me several weeks. At the same time, the watches had to be repaired and delivered on time. Between 1959 and 1960, I put in some 5,000 hours of work. Occasionally a friend would turn up and help me fit

some component, but for the most part I worked without assistance and often through the night.

In those days of shared telephone lines, extensions were unobtainable, and the answerphone had not been invented. To answer the phone, I had to sprint seventy yards from the garage, turn sharp right twice, run up sixteen stairs and unlock the door to the flat. I could usually do this in under twenty-five seconds, and without puffing, essential if one wanted to sound dignified on the telephone.

With the completion of the Bentley, life was less hectic and even a little flat. To make good use of the finished car I entered it for various *concours d'élégance*, and won first prize on each occasion, but this was merely a form of bragging and soon lost its appeal.

I quickly realised that the condition of the car precluded using it as general transport. It would soon begin to lose its pristine appearance, and I was loath to see that happen. In 1959 I had bought an open sports Bentley and my thoughts turned to competitive events. I therefore decided to sell the saloon and concentrate on the sports car, which had a larger, 4.5-litre engine, and a lighter body. In spite of the time spent on the landaulette I convinced my bank manager that I was improving my business to a point where he could confidently lend me the money to buy the car. It cost £295, and was bought in Plymouth. On the way home I began to realise it was in need of a complete overhaul, but because it was more powerful this was not immediately obvious. It was this apparently good car that prompted the words: 'The purchase price of a car is merely the down payment on an expensive rebuild'. This has become a classic, much-quoted caution on the folly of buying old cars.

After some general repairs and replacements I began to use the car for everyday transport. Its 4.5-litre engine seemed enormously powerful after the 3-litre-engined, heavy landaulette. By now I was a member of the Vintage Sports Car Club and the Bentley Drivers' Club. These gave me the opportunity to participate in competitive speed events.

The landaulette was sold to a dealer, Jack Bond, for £800, a remarkably high price for such a car. Some two or three years later I saw it parked on Blackbushe Common. A large, red-faced man was snoring in the back seat. He awoke when I approached and asked if I was interested in the car. Naturally, I was very curious. He enquired if I would like to own it. I said I wasn't sure, but how much would it be? 'Why not make me an offer?' he replied. 'What about £300?' I proposed, whereupon I was rudely invited to go away. The car eventually went to America, where it was neglected until it returned to Britain in 1992. Since then its elegant coachwork has been removed and replaced with an ugly touring body. This, alas, is the fate of so many closed vintage cars. I often think back to those beautiful summer runs with a full house, and Henry singing for sheer ecstasy, his cage swaying from the roof.

At that time Henry was a part of my daily existence. He lived in a blue cage that complemented his splendid pale-yellow plumage and colour-coded blue beak. In the garage he chattered endlessly to the sound of busy tools and could make sounds like spanners falling onto concrete floors. In the house his cage stood on the mantle shelf so that he could admire himself in the mirror. We talked incessantly, and he learnt to sing the Flanders and Swan song 'Have Some Madeira M'dear'. In addition he had a variety of catch phrases, including 'Three cheers for W.O. Bentley!' and 'For God's sake, it's not raining again!' Altogether a very endearing companion who would sit on my shoulder and talk while I got on with the watch-repairing. For the two years I spent juggling with the problems of earning a living and rebuilding Bentleys he was almost my sole companion.

A SIGNIFICANT MEETING

My first competitive event was at Silverstone. It was a very wet day, and my supposedly fast car proved to be slow and unreliable. It misfired badly, and after three laps ran out of brakes. It was all very disappointing, and I returned home determined to rebuild it and

make it more competitive, for by this means I would enjoy a new and exciting pastime and increase my growing circle of vintage-motoring friends. The plan was to bring most unexpected results, for it was at a race meeting that I met Philip Mann, a like-minded Bentley enthusiast who introduced me to the formidable Cecil ‘Sam’ Clutton, a founder member of the VSCC and an acknowledged master and historian of motor cars and motor cycles, keyboard instruments (including the organ, clavichord, harpsichord and spinet) and, of particular concern to me, antique watches.

I met Sam in 1960. I was driving the sports tourer Bentley which, in the previous six months, I had rebuilt. He admired the car and its condition, and the conversation then turned to horology. We flirted briefly with some aspects of watches, and I knew I was being probed to see if I was worth continuing with. I had no practical experience of antique watches, but I was generally familiar with their history from the books I had read as a schoolboy. His comments and questions were put to me in a stiff and formally detached manner. I once heard his aloof manner of talking described as speaking with a mouth full of cut glass. I wanted nothing from him and so was not influenced by his tone. I felt he was holding me at arm’s length in case I didn’t suit him. I had no objection. I knew that if I didn’t suit him, he wouldn’t suit me. But I did know he was important, and that I could learn much from him if I were permitted to know him as a friend. Suddenly his voice changed dramatically, and in the friendliest tones he invited me to dine with him at his house in Blackheath.

A week later I did so, and was introduced to the fascinating world of antique watches and their history. I was allowed to open and examine all his watches, and was invited to comment on their technical merit. I did so with enthusiasm and some excitement, for I was now looking at the wonderful inventions that I had read about in the Kenton library all those years ago. It was altogether a very successful evening. He was most interested in some of my comments regarding the development of the mechanisms, and expressed his pleasure in our conversations.

I too was very pleased that we had got on so well, and in the following months we met many times. Although we always parted in

agreement on horological matters, and he often adopted my views when he believed them to be correct, our relationship was very delicately poised on other matters. His extraordinary personality would change from one moment to the next. He had a very low boredom threshold and considered that his time was being wasted if he was not increasing his knowledge. He could be extraordinarily kind when the fancy took him, and viciously unkind if he felt his authority was being questioned. Many a young vintage motorist would converse with him on vintage cars in the hope of gaining his acquaintance, only to recoil at the lash of his response because he believed they were trying to upstage him in public. He was, indeed, contemptuous of my lack of knowledge of vintage cars, but this was of no consequence to me. I simply enjoyed my Bentley, and had no other interest in motor cars. Instead we met frequently to discuss various, unpublished aspects of antiquarian horology. Often we visited other houses to see and discuss some particular historic horological feature. Always anxious to broaden his interests, he would listen intently to my remarks. It was his intellectual curiosity, combined with my instinctive comprehension of the mechanical problems encountered by the early makers of precision timekeepers, that prompted so many hour-long discussions. They expanded my knowledge and improved his, so we both benefited from them. It was a most exciting and constructive period for me. I was still earning my living repairing modern watches, but these were now interspersed with antique watches that sometimes needed new components made especially for them. I did the best I could with the limited tools I had, but it was obvious that if I were to succeed in a serious way I would need a better workshop. This would require money and more space. I had neither.

Sam was keen that I take a greater interest in antiquarian matters. I had begun to take on work from the collection of the Clockmakers' Company, which, being regarded simply as a curiosity, had been neglected for many years. But under Sam's influence the antique watch was beginning to assume greater importance, and collectors were looking to have their clocks and watches put into working order. He persuaded me that I should look for bigger

premises with more scope for advancement. He had a bit of spare money and was willing to lend it to me for such a venture. I looked at a few shops, and indulged in the romantic notion that with a shop of my own I could make a profit from retail sales as well as repairs. For as a trade repairer I was the first to suffer if shopkeepers had no surplus work to put out. In the end, however, I concluded that I was too undisciplined to keep regular hours, and must look for premises that did not need daily attention.

It was at this stage that I was made to see that I wasn't indestructible. Some eight years earlier, when attending evening classes after a long day's motorcycle journey across London from Edgware to Croydon, I had begun to suffer from severe headaches and abdominal pains. A year or so later I had an appendix operation, but it made no difference. Occasionally I had fainting spells, which I would divert by kneeling down with my head between my knees. This happened to me once on the motorbike, and I did my kneeling trick while pretending to adjust the engine, which must have looked very comical. The condition deteriorated, and my vision was affected by flashing zigzag lights and dramatically coloured swirling clouds. It never occurred to me that this was the result of over work, that sixteen hours a day every day was too demanding. After all, I needed no incentive to do the work, and was not depressed by its regularity. When the work was arduous, requiring either great mental concentration for the watches, or physical stamina for the Bentley, I would set myself a target for the day and close my mind to everything else. I would keep this up for as long as was necessary to finish the task in hand, sometimes several months. Migraine was diagnosed, and believing this to be a female complaint, I resolved not to suffer it any more. Now that I knew it was not serious I relaxed, and I cut my working day to twelve hours. So gradually the symptoms receded. But it was an unheeded warning, and would be followed over the next forty years by several more serious complaints, all brought on by my excessive and obsessive desire for greater achievement.

AN ESSENTIAL ACQUISITION

One day in 1962, in my local cafe, run by tall, wafer-thin Agnes, who supplied delicious hot meals with pudding and tea for one shilling and sevenpence, I met my local estate agent Paul DeFargo, who was also a friend. He was in a state of some elation and could hardly wait to tell me the good news. His wife had presented him with a son. Once I had absorbed this news and given all suitable congratulations, the conversation turned to my problem of larger premises. 'I know the solution!' he cried, still in a fever of excitement about the baby. 'Come with me. I have the perfect house for you. And to celebrate, you can have it at a very reasonable price.' Somewhat apprehensively I went with him to his office, where he showed me the specification for a semi-detached Victorian house about a mile away. He produced the keys and sent me off to view it. It was an elegant house, with about a quarter of an acre of land, and situated in a wide, spacious road lined with cherry trees. I went inside and to my astonishment found that it was fully furnished, and, although no one was at home, obviously occupied. I went from room to room and it was indeed an excellent house. Returning the key, I discovered that the house could be bought for £2,400, which was a low price, mainly because it was occupied. I explained that I would like to buy the house, but not while occupied. If I could persuade the occupier to move, could I still have the house at the same price? Such was my friend's euphoria that he agreed.

I called upon the occupier that evening. I explained that I had bought the house, and would move in seven days' time. He was rather taken aback, and complained that he had nowhere to go. I pointed out that it was not my affair, and that I expected to move into an empty house on the date given. But I asked my landlord, by now a friend, if the occupier of the house could move into my flat. My landlord didn't mind in the least, so long as he got his rent. So it was back to the house to tell the occupier of his good fortune. The end result was that we met halfway, he in his removal van on the way to my flat, and me in a van on the way to the house.

So I had the house and the keys. Now I had to pay for it. I showed it to Sam, who agreed to lend £1,000 towards the purchase. My bank manager offered a further £1,000 if he had a sound condition report, and I sold my sports tourer Bentley for £800, making a total of £2,800. The small amount extra was necessary for immediate improvements. Sam came to see the house and liked it. 'Very suitable,' he said, noting that it was smaller and not as elegant as his Blackheath house. I explained that I needed a surveyor's report. Sam settled this at once, for he was then the senior partner in Cluttons Crown Agents and Surveyors. As we stood in the middle of a ground floor room, he suddenly leapt to a considerable height and landed hard on his heels on the wood floor. The resulting explosion of sound reverberated from room to room before dying away in the attic. Sam listened intently and then abruptly left for another appointment, declaring as he went that the house was in perfect condition and that he would send the report. And so it was that, in 1962, my friend's pleasure in his new baby turned me into a householder.

The following Sunday, a beautiful summer's day, saw me settled on the back doorstep, eating my first breakfast as a householder. The view wasn't very inspiring: a huge pile of old motor tyres, some scrap bicycles just visible through a forest of two-metre tall brambles, and a collapsing shed containing some three or four dozen empty gin bottles, but I felt only the contentment and pride of ownership.

In the flat my workshop had been a roll-top desk in a corner of the drawing room, and the top of an adjacent sideboard. The new workshop was a five by five metre bedroom and offered ample scope for development. The desk remained in service, but the top, which I had used to cover up the bench on social occasions, was no longer needed. I also made additional benches. I bought a second-hand Myford lathe from Exchange & Mart for the manufacture of tools and clock parts. My aim was to expand the antiquarian side of my business with a view, eventually, to specialising entirely in antique clocks and watches.

During my first two years in my new house, most of the rooms were either empty or used for storing Bentley parts and large tools.

There was no garage, so I cleared away the gin bottles and prepared a space for one. The new Bentley rebuild, which I had started before selling the tourer, was still resting in a rented garage, but as I hadn't any money to continue the rebuild the lack of a garage was not an inconvenience. As a matter of priority, it was built within the first year, but it was a further year before I could afford the doors to complete it. When at last the doors, brought from a demolished chapel and cut to fit, were in place, it was time to install the Bentley chassis. This was comprised of the frame, with front and rear axles fitted, a steering box with steering wheel fitted, and a handbrake. It would be necessary to push the chassis from the garage, through South Norwood High Street, which meant passing the police station, up the humpback bridge, over the railway and from there downhill all the way to the house.

My friend David Newman and I started out very well, and pushed it easily along the quarter-mile or so of the high street, but when we got to the bridge we simply couldn't push hard enough to get it over. We stopped for a breather and discussed our predicament. Unless we could find some extra pushers we were stuck. Just at that moment a hooter was politely sounded to attract our attention. Thinking we might be holding someone up we looked behind us, and to our dismay saw that the whole length of the high street was blocked in our direction by stationary traffic. We had overlooked the home game at Crystal Palace, and here were the spectators going home. We prayed they had not lost! They could not pass us because we were at the start of a corner and we couldn't go back for there was no room. I explained our difficulty to the driver of the first car. He seemed to think it was amusing (his team must have won!) and offered to help us push it over the summit. Soon two others came to help and now the chassis rolled easily over the top and started off down the home side. It gathered speed remarkably quickly, so that I had no time to thank our saviours and had to jump on to the chassis rails and steer it all the way home. My friends, unfortunately, had to walk. With the Bentley chassis in the new garage life felt more complete, and I could recommence the horology / Bentley timetable.

During the previous year I had worked hard at the bench, repairing both antique and modern watches. Thanks to Sam, my circle of customers now grew, and I turned increasingly to the antique watches. Upon completing a major restoration I would photograph the components and use them to advertise in the trade papers. All the pictures were taken with a Leica camera which I had purchased after the sale of the landaulette. It was the fulfilment of another teenage ambition to own what I considered to be the most compact and beautifully made camera on the market. It was in constant use. Every aspect of the horological work was photographed and the prints stored in envelopes carrying detailed information concerning the subject. By this means I built up a huge collection of prints for future use. There was no immediate reason for forming this photographic collection, but it seemed like a good plan to have some record of the complex and beautiful objects I was privileged to play with. When, in 1965, Sam and I came to write our book, *Watches*, the merit of the collection and the work entailed in its formation was proven – it provided the illustrations for the whole of the monochrome section of the book. It has also provided the colour illustrations for several other books written since.

As a matter of interest, the Leica camera was invented by Oscar Barnack, chief technician of the E. Leitz Optical Co. in Wetzlar. The first models were presented for sale in 1926. Over the next ten years it was developed into a high-precision, compact camera, taking thirty-five exposures on 35 mm film. It grew into an industry, pandering to every whim of the professional and amateur photographer. The hundreds of different and useful gadgets made to fit the basic camera are now collectible items, as are the cameras themselves. My love of small precision engineering and the logical form and function of the camera made it attractive to me. I confess I fell into the collecting trap myself, and was not satisfied until I had one of every model made between 1926 and 1950, and many of the gadgets to go with them. But unlike most collections, I put them to practical use in illustrating my books.

Sam and I met frequently. We both lived alone, and could make unplanned visits whenever there was something to see or discuss.

My interest in antique watches became a passion, and I sought every opportunity to increase my experience. At this stage Sam's influence on my career was profound, and I expressed my appreciation as and when I was able to do something for him. He would dismiss this as nonsense, but he was pleased just the same. Through him I met everyone of influence in the antique watch world, and many of them put their collections at my disposal to examine and restore.

The responsibility of taking in valuable watches for repair was impressed upon me during an evening's flying at Redhill aerodrome. Sam was a member of the Tiger Club and flew Tiger Moths fairly regularly to keep up his flying hours. When it suited him he would invite me along. On one occasion, I arrived to find him already practising aerobatics. He performed what looked to me to be a very complicated manoeuvre, which culminated in falling backwards, upside down, at the top of a loop. When he landed, I congratulated him on a spectacular trick. He told me that at the top of the loop his briefcase had started to tumble out of the cockpit. In grabbing it he had been forced to let go of the controls and, having retrieved the case, couldn't remember where the ground was. He explained the importance of the briefcase: it contained a Breguet watch belonging to the fifth Lord Harris that was to be passed to me for repair. The watch had a lucky escape, but it was to have another close shave before it reached my workshop. That weekend I stayed with Sam at Blackheath. When it came to leaving, I put my bag, now containing the watch, on the ground while I manoeuvred my enormously heavy Bentley saloon out of the garage. With a sudden burst of renewed conversation, I forgot where the bag was and reversed over it! It was a charmed watch, for it was untouched. My new Remington razor, however, was crushed into small pieces.

Only once did I have difficulty with a collector. He was Charles Durand-Ruel, the celebrated Parisian Impressionist collector and dealer. His wife was a descendent of Breguet. This prompted Durand-Ruel to collect Breguet watches without understanding them, so that some were in need of attention. I did a certain amount of work for him, but he didn't pay my bills. After some months had

passed I visited him in Paris and we lunched at his flat. His debt was not discussed. After lunch we spent some time discussing his collection and the attention it required. One watch in particular needed repairs to the dial, and it was agreed I should take this back to London.

Back home, I wrote to him detailing his debt to me, and requested payment. Receiving no answer, I wrote again, explaining that I would dispose of his watch to cover the debt. Again no response, and so I sent a recorded letter to be sure he understood my intention. After waiting a further four weeks I sold the watch, deducted my charges and sent him, through his London agent, the balance of the sale. I never heard again from Durand-Ruel, but on a later occasion his name added much stature to mine. I visited an Impressionist exhibition in Chicago which included his portrait, and seeking something to say to the organiser, I mentioned our acquaintanceship. Within a few minutes I was being greeted as the friend of Durand-Ruel and enjoyed a much-undeserved day of popularity. I was later told by a mutual acquaintance that Durand-Ruel could never be bothered with small bills and tended to overlook them. He was a most intelligent, congenial and unpretentious man, who travelled about Paris on a moped. I just could not afford his company. Otherwise I remained friends with most of my collectors, and visited them often. Alas, most are now deceased.

Lord Harris of Belmont had a comprehensive and remarkable collection of clocks and watches, which I would pick up from his house in Kent. This entailed a pleasant drive, usually in a vintage Bentley, to Faversham, where I would spend an hour or two with him while we put right the more obvious faults with the world in general. He was a keen cricketer and one-time president of Kent Cricket Club. One of our self-appointed tasks was to select the English team for the test matches that season. It was easy enough to notice that there was never anything to eat or drink, and I would carry a sandwich with me for lunch. Naturally, I offered the packet to George (as he insisted I addressed him), and he willingly took one. This later developed into a picnic, which my wife would prepare and we would eat together in the orangery. George was always concerned that he

had no money, and was not inclined to spend it on non-essentials like food for visitors.

Edward Hornby was the exact opposite. He always laid on an excellent dinner with good wine, so I would visit him frequently. He is also the owner of two Daniels' watches. When he sold his collection of watches at Sotheby's, he kept his Daniels' watches and thus underlined his good taste and judgement. The watches are now worth several times what he paid for them.

The seventh Duke of Wellington possessed beautiful Breguet watches bought by the first Duke, who dealt directly with Breguet. When in London he stayed at Apsley House, No. 1, London, and we would occasionally meet for coffee and talk about the Breguet watches which I had restored for him. The first Duke bought many Breguet watches as presents for his most favoured officers.

Lord Harrowby possessed a Breguet watch which had seen continuous service since its purchase in 1820. It was looked after by his gardener who would, as necessary, poke it into life with a penknife. The winding square was almost without corners after 150 years' service, and it was too much for the gardener to cope with, and so it came to my workshop for attention.

Through Sam I entered a new world of collectors, connoisseurs and students of watches. I felt more assured as a restorer, and confident of the validity of my views, and my interpretation of historic events in timekeeping. I had the thrill of studying and restoring the work of past masters: John Harrison, who proved the theory of navigation by timekeeping; Thomas Mudge, the inventor of the lever escapement that has been in use now for some 250 years; John Arnold, who produced the first practical timekeepers for navigation, which were available for purchase by ships' navigators; and Thomas Earnshaw, who rationalised the manufacture of marine chronometers to make production more certain and more cheaply available. These men provided the means for accurate navigation, and thereby founded the wealth of the British Empire. It was the study of their work and of Breguet's that turned my thoughts towards making my own contribution to an art that needed resuscitation.

5

INTRODUCTION TO BREGUET

The two years following the purchase of my house were a kaleidoscope of activity. Extensive travelling (since then a feature of my life) took me to America, France, Germany and Switzerland. My first trip was to the Maison Breguet in the Place Vendôme, Paris. Sam Clutton had bought a very expensive Breguet watch, and my task was to repair it and remake some damaged components. When finished, we had to take it to Paris and search for its entry in the Breguet books – nothing less would do. At the same time, I would be able to meet George Brown, then the proprietor of the firm.

Abraham-Louis Breguet was born in 1747 and died in 1823. He was then, and still is, the most celebrated and admired of watchmakers. His watches, expensive in their day and among the world's most valuable watches now, set the highest standards of technical perfection, innovation and aesthetic beauty. In a period when English watchmakers reigned supreme and the development of the watch was the slave of science and navigation, Breguet chose a different route to success.

From 1787, the date of his earliest surviving books, Breguet assembled a team of some hundred workmen to interpret and manufacture his ideas. His earliest recorded work was the manufacture of self-winding watches. These were carried in the pocket, and were automatically wound by a platinum wright which was oscillated by one's daily perambulations. They attracted the attention of the noble and the wealthy, who soon became Breguet's customers, as, eventually, did most of the crowned heads of Europe,

including those in Britain, France and Russia. Both Napoleon and Wellington carried Breguet watches. In fact, one watch started for Napoleon was, after his defeat, finished and sold to Wellington. The enormous variety of Breguet's work set him apart from other watchmakers, who specialised in one particular type of clock or watch. His clocks and watches varied from the simplest pieces, sometimes with only one hand, to precision chronometers, repeating clocks, and watches that sounded the hours, quarter hours and sometimes the minutes, on bells or gongs. Watches with his *tourbillon* carriage had an escapement that rotated constantly to equalise positional errors (for a variety of reasons, mechanical watches will keep a different rate of timekeeping in different positions; by constantly turning the escapement through every position Breguet eliminated the problem). His most spectacular offering is a watch which, when placed at night into a cradle of the mother clock, is wound and set, ready for use the following day. It was with inventions such as these that Breguet held the attention of the horological world and enjoyed a fame and fortune that was unique in the field.

My growing interest in antiquarian horology was now suddenly and obsessively focused upon Breguet. The only books available were Sir David Salomons' catalogue of his collection of Breguet watches, and the story of Breguet's activities during the French Revolution by Claude Breguet. Salomons' catalogue contains over a hundred descriptions of the watches he collected. Every kind of watch is illustrated, and Salomons clearly had a great appreciation of Breguet's genius for timekeepers. The catalogue inspired me to learn more about Breguet and his work. There were many stories about Breguet himself, extolling his brilliance and describing his benevolent character, but accounts of his work contained a great deal of speculation, simply because it had never been analysed and categorised. There was no clear, overall picture showing the development of its style and complexity. I resolved to specialise in Breguet's work, and undertake this study.

First, however, there was the Bentley chassis in the new garage. If it was not finished soon I would have no racing for the coming

year. There was much to do to make the car usable. Rebuilding the engine, gearbox and radiator would take time and money, and, as usual, I had little of either to spare. So I was forced to revert to my old system of dividing the week into two parts. I was back to four sixteen-hour days on watches, and then every spare hour on the Bentley. Once the engine and gearbox were finished and fitted the next major task was the body. I had designed a neat, four-seat body styled on the 1930s Le Mans cars, which was to be made in wood and covered with fabric in the 1920s style. I had no facilities or tools for making the frame and so I entrusted this work to a friend. We did not discuss the price on the principle that among friends the price was the price and wouldn't be exorbitant, and in any case I was determined on the plan, so the price wasn't the most important thing. In the end it cost £400 and, as I was billed in four instalments, I could prepare for payday in advance. Because I was not assisting with the body I could apply the Bentley part of the week to the watch work, and so I kept my head above water.

MARRIAGE AND MARRYAT

My social life was confined to visiting watch clients who had become my friends, and I dined out frequently and without expense. One such client was Robert Marryat, who had inherited a remarkable collection of watches, including many Breguets. I restored several for him, and when I collected or delivered them was sometimes invited to stay for dinner. On one occasion dinner was served by a pretty young woman who turned out to be his daughter Julie. We met frequently in the following months, and, to cut the usual long story short, eventually resolved to marry. The wedding took place at Esher on 13 June 1964, and we left for our honeymoon in the newly completed Bentley. Indeed, the Bentley was completed only because my new wife had paid for the seats, windscreen and hood for the new body!

Settling down to married life was not a natural thing for me. I was thirty-eight years old and used to being alone and self-reliant.

My wife was twenty-five and used to a high standard of living. Matters were made easier for me by a marriage settlement held in trust for my wife. This gave her a greater income than I had, but her income was classified as unearned and, we were to discover, suffered a higher rate of income tax. My income had never attracted anything other than the lowest tax rate, and so my book-keeping was rather sketchy. As a consequence, when the final assessment was made, the whole of my income now went in tax. That was when the vengeful nature of socialist philosophy forced itself on my attentions. But these matters were soon resolved and we lived contentedly together.

For the first time since I was in digs in 1956, I was eating regular meals and the completion of the Bentley left more time for relaxation in the evenings. Looking back, I realise that I was not a good husband or father when we produced our only child, a daughter. It did not occur to me that anything was more important than developing my obsession with horology, or that there was anything more relaxing than racing in club events. My wife did attend one or two race meetings, but lost interest after the car failed one day on the M1 motorway when the oil pump seized. Lying underneath the engine we removed the sump to discover the failed oil pump. A new gear was fitted, but unfortunately it had to be delivered from London and didn't arrive until six o'clock in the evening. It was eleven o'clock when we arrived at our hotel, the Brave Old Oak in Towcester. With the British hotel hospitality typical of the period, we were told that there was no food or hot drink, so we retired with only cheese biscuits and beer. The next day, during practice, I discovered that the crankshaft bearings were ruined as a result of the oil pressure failure. During the following week we dismantled the engine and had new bearings made so that the car was ready for racing on the Saturday.

My wife played a noble part in the repair and preparations, but she never went racing again. Her great forte is gardening. She can create a garden out of a patch of concrete and anything she plants will grow. During the thirty years we were married she never once objected to my behaviour, so I was free to do as I pleased. This was

most beneficial to my work, which usually started as early as 5 a.m. in the summer and continued until 6 p.m. I found it very satisfying to look out of the workshop window early in the day, to a world of a thousand chimneys and imagine under each, as in my house, a family asleep. While they slept, I would do before breakfast what would, to most of them, be the best part of a day's work.

My father-in-law, Robert Marryat of Marryat and Scott, lift manufacturers, was a keen and accomplished yachtsman. He had sailed a variety of different boats in most of the waters around the British Isles, but none had ever quite satisfied him. Before the war he had bought and stored sufficient teak wood to build his ideal boat. This was completed in the 1960s by the Moody shipyard, on the Hamble. It was a most beautiful craft, built to the highest standards of design by a yard noted for its quality of construction. The sixteen-metre hull was rigged as a Bermuda sloop, and kitted out in some luxury by my mother-in-law. She had loyally sailed throughout their marriage without actually liking it, and so could be excused for thinking of her comfort.

Named *Larne*, the yacht was nominated Lloyd's Boat of the Year in 1965. Because Robert had convinced himself that his absence from the office would leave his company floundering in chaos, he felt unable to plan ahead for his sailing expeditions. Consequently, I was often asked quite unexpectedly to crew on long voyages. My only sailing experience had been the gentle meandering around Chichester with Tony Packe, when we had always been in sight of land. Robert, however, was a determined deep-sea sailor, impervious to rough weather and big seas. I was always reluctant to crew for long voyages but felt a certain obligation to assist when no other crew member could be found. I certainly had no objections to sailing in the Channel. This could be exhilarating on a sunny day with a stiff breeze, and there was always a secure harbour nearby where, fit with the exercise and fresh sea air, one could relax over a good meal and a glass or two of port wine. But a long journey of several days in heavy seas could be very wearing, and in foul weather even depressing. The Bay of Biscay and the Atlantic Ocean to Cork could be very demanding and bruising to the body and arms.

It was not my idea of fun, but it was an adventure, and I knew one should feel privileged to sail in such a magnificent boat.

Of course, there were compensations. To be at sea on a small, silent boat, out of sight of land for several days, engenders a tranquillity of mind that one must experience to understand. To be on duty at the wheel in the early hours of a moonlight night, the boat keeping pace with the wind so that all is calm, is a magical experience. The first time I was trusted to steer at night I remembered Masefield's plea for a tall ship and a star to steer her by. There I was in this very romantic position. Unfortunately Masefield didn't mention the rotation of the earth and I soon found myself steering the wrong course!

On another occasion, on a black stormy night, we headed for the Scilly Isles. I was steering in a following force-six wind with the compass swinging violently as the boat corkscrewed its way forward. In these conditions a lot of effort is expended at the wheel in keeping the compass on course. I was spinning the wheel so violently to hold the compass steady that I became confused and swung the wrong way. I was now side-on to the wind and didn't know what to do to right matters. Robert and the other two crew members were in their bunks. I knew they couldn't be asleep because the boom was flailing about in the wind, so I decided to stick to my action and keep the boat turning until it pointed down wind again. I had no idea if this was feasible but it was something to do other than simply wait for assistance. She turned smartly enough and the boom followed suit, so that when Robert came on deck all was well. I shouted to him above the wind something about getting a bit off course but that all was well now. I don't suppose it would have mattered who was on watch. Neither I nor the other two crew members had any experience of deep sea sailing.

Robert was an excellent sailor and a brilliant navigator but he was incapable of explaining to us what to do when in difficulties. He had amazing trust in his crew's common sense. My last trip was to Cork, in Ireland, a voyage of some four days. The second night we reached the Scilly Isles and anchored in Crow Sound. My wife and I made up the crew and we both felt somewhat anxious about our

anchorage, which was surrounded by rocks sticking up all around us like dragon's teeth. Our anxiety was increased by Robert's remark that the lighthouse he was using as a bearing was suggesting that we were not where we wanted to be. But, with infinite faith in his navigation, he said it was out of order and giving the wrong signal! He was of course right, but we slept fitfully, listening to the waves dashing on the rocks, and were pleased to leave by first light. When we arrived we were welcomed by the commodore of the Cork Sailing Club with a feast and as much port wine as we could drink.

The next morning we set off for home and within twenty-four hours of arriving the boat had been stolen. The thief was a young man who, after stealing an earlier boat, had been taught at borstal how to navigate, presumably so that he could expand his business and steal even bigger boats. It took some months to get the boat back and put it into order again. Sometime later, while anchored in a Spanish port, Robert was arrested and thrown into jail for being in possession of a stolen boat! Being something of a masochist, he thoroughly enjoyed this new experience. All I can say about the cold, wet, rough sea is that I'm glad I experienced it, but have no desire to repeat the experience. I once heard it likened to standing under a cold shower tearing up five-pound notes. Sailing was to play no further part in my life.

PROFESSOR DAVID TORRENS

I met Professor Torrens in 1962. He was a most extraordinary man. He had started his career as a laboratory assistant at Trinity College, Dublin, and over the years had risen to the position of professor, a post he retained until his death in 1966. Upon his retirement he had proposed to write a treatise on watchmaking which would include his personal experiences during the previous sixty and more years. Outside the classroom, watchmaking absorbed him completely, and he collected books on all aspects of horology. He had accumulated a vast library on the subject and could quote from most of his books without opening them. His passion, however, was watchmaker's

tools. He attended on all the widows of the nineteenth and early-twentieth-century watchmakers and generously bought their obsolete tools. He stored them in his rooms at Trinity College, along with the books.

I had met Torrens in London, and there we talked at length about watchmaking and my wish to start manufacturing. He mentioned some dial and case-making machinery that was stored at the workshop of A.T. Oliver in nearby Spencer Street. He said I could have it if I collected it, and there were also some parts in Dublin which I could collect. I knew Oliver, and called in to see the machinery. It was in pieces in his cellar and in neglected and rusty condition. I explained that Torrens had given me permission to take them, but Oliver, with typical Clerkenwellian possessiveness, was most reluctant to let them go. It was only a day or two later that I was allowed to take possession, and then Oliver made a particular point of not helping to load them into my car. Some of the parts weighed as much as 27 kg and it was all I could do to lift them up one step at a time, carry them across the pavement and lift them up to the height of the car. At the time I had a Rover saloon of the post-war type in which the boot overhung the rear axle to give a shorter wheelbase. Most of the machinery was in the boot, and the steering felt distinctly light compared to when the boot was empty. I became very conscious of this when approaching a traffic policeman on Blackfriars Bridge. The car was rolling directly towards him and was responding all too slowly to the steering wheel. I managed to avoid driving into him only by dabbing the brake pedal to transfer some weight onto the front wheel. Once across the bridge, to avoid further embarrassment I took out some of the bits and left them, on the strength of a ten-bob note, in the care of a news vendor. I returned later to collect them.

Some weeks later I visited Torrens at Trinity College Dublin and collected the final parts of the machinery. I was able to examine the watchmaking tools in his rooms and concluded that they were mainly highly specialised pieces, constructed for one operation only, after which the work would then be passed to another specialist for further attention. It was obvious that the old methods of hand watchmaking

would not be suitable without a team of specialists, and I must simply adapt myself and my equipment to achieve the results I wanted. So I put behind me the romantic idea of resuscitating past tools and methods, and got on with the task in hand by whatever means available.

Many days were spent cleaning and restoring the parts of the machines, which were in a bad state of neglect. Nevertheless, their potential was obvious. I had new screws and slides made by specialists in Birmingham, and new racks and rose cams made to clarify the decorative patterns produced on the surface of the work. It took more than a year to complete the work, but at the end of it I was ready to start practising engine turning dials and cases. This work, called *guillochés*, is an entirely separate art, and it requires great concentration, when applying the cutting tools, to ensure a perfectly uniform finish. Not having anyone to turn to for advice prolonged the learning time. Cutting patterns on the curved surfaces of cases so that the transition from axial to radial cutting was completed without blemish was especially difficult. It is most important that the finished dial, under the closest scrutiny, must be free of blemishes. The smallest error shows up immediately and cannot be rectified. One must simply restart the whole process. But as with so many tasks, once the techniques are mastered the difficulties disappear.

The machinery was especially useful for dial-making, in which the separate zones of the dial can be emphasised by contrasting background patterns while the chapter rings and information sectors can be left smooth for engraving. Thus, Torrens's gift of redundant nineteenth-century machinery, combined with hard practice, had solved my dial-making problems.

TO CALIFORNIA

Fortunately, my wife enjoyed travelling, for I was increasingly journeying to America, France and Switzerland. In America, we would stay with Sam Bloomfield, a collector of watches, guns and violins. He was the wealthy retired president of the Swallow Aircraft

Company in Wichita. As a young man in 1920 he had taken a degree in aeronautical engineering in Munich. In America, he had applied for a position as designer to the Swallow Company and been accepted. During the course of his duties he discovered that the company was heavily in debt to the bank, and his job was to design a new and saleable aircraft to make the company solvent. Then, one day, the president of the company crashed in his own plane and was killed. Much concerned about this, the bank manager called Bloomfield to his office to outline a proposition. If Bloomfield could make the company solvent and pay off its debt to the bank, then the Swallow Company would be handed to him.

Bloomfield, a man of immense practical intelligence, succeeded by fitting larger engines to strengthened stock fuselages. This enabled greater payloads and assured the successful sale of the planes. Thus Sam Bloomfield became the owner of the Swallow Company and proceeded to become very wealthy as an independent manufacturer free from the stress of corporate decisions. He retired in 1960, and began travelling the world to buy his watches, guns and violins. He must have been immensely wealthy, for he had three Stradivari and two Guarneri violins in his collection. His favourite, which he sometimes played, was the famous ‘Lady Blunt’ Stradivarius. I was allowed to make a sound on this violin, and although I had almost no experience of such instruments I could sense the superiority of the rich, sonorous tone so easily coaxed from it by the lightest touch of the bow. To his astonishment, I put to use my musical education with Tony Packe and played him a melody on one string!

Bloomfield lived with his wife Rea in an enormous house in Holmby Hills, California. It had been built for a 1920s film star and was equipped with every luxury. Every one of the ten bedrooms had its own bathroom and sitting room, as well as its own veranda and air conditioning, so that one could either be warm in the sunshine or cool indoors. The ground floor had marble floors, fountains and waterfalls. The whole atmosphere of the house was unreal and could have been a Hollywood film set. Sam and his wife, who were really simple country people, lived mainly in the kitchen-corner diner or

Sam's study which housed his guns and violins. One room on the ground floor had been set aside and fitted out as a workshop. This was my domain, and the reason for my visit – I was to clean his watches and clocks. I also took the opportunity of seeing something of America. On my first visit, in 1963, I went alone and stayed four weeks. I spent most of the time working, but for relaxation I was taken to Las Vegas and stayed at Caesar's Palace. It was a mind-numbing experience of how to fritter away time to no purpose whatever, and I was glad to get back to the workshop.

It was suggested that the visit should be repeated on a yearly basis, enabling Bloomfield to improve his collection and giving me a regular holiday. This wasn't possible, however, as I was too busy in London, and in any case I didn't find California very stimulating. Later visits were made with my wife, both to Palm Beach and San Diego, as the Bloomfields moved around. When we first visited Palm Springs in 1965 there were a few houses belonging to famous names such as Bing Crosby, Bob Hope and Gene Autry. Ten years later so many houses had sprung up that the once clear blue sky was now filled with clouds from the swimming pool vapours trapped in by the encircling mountains.

It was in Palm Springs that I met Mario Confente, the Italian Olympic cyclist. He made racing bicycles individually tailored to fit their riders, and had made the machines for Eddy Merckx to ride in two world championships. There could be no better reason for buying one, and accordingly I placed my order. This wasn't as simple as buying the Hetchins. I was made to ride a bicycle that was adjusted to suit the rider while measurements were taken; but when I described the features that I wanted I was told that I couldn't have them. For some, my riding style wasn't suitable, while for others the European road surfaces demanded particular features, so that my preferences were set aside. I suspected there was a certain amount of gamesmanship in this to convince me of the special attention I was getting. Every time I questioned him about his decisions he responded by finishing his sentence with the phrase 'ita comesa froma ze 'eart'. There could be nothing more sincere, so I acquiesced. When the frame arrived some weeks later I felt it was

rather more his than mine. The workmanship was beautiful and was altogether a pretty machine, which is important when one is buying something one doesn't actually need. Twenty-five years on I still use it, but somehow it doesn't seem to be so quick as the Hetchins. Perhaps my feelings come from the heart!

YORKSHIRE

In the early 1970s, my wife and I discussed the merits of moving away from the increasing congestion of south London. When I had first moved to South Norwood in 1952 it still retained its pre-war character as a well-to-do London suburb built on the Southern Railway commuter line to Victoria and London Bridge. The large houses, without garages, were mainly occupied by one elderly family, and the streets were empty of parked cars. Twenty years later, with most of the houses occupied by two or three families and car ownership rapidly spreading, the streets were fenced both sides with parked cars and choked by slowly moving traffic. We felt that a house outside London, with suitable workshops and garages, would be more enjoyable. It would, however, have made it difficult for me to attend to my London interests. These were vitally important to me if I was to achieve my ambitions in horology, and so the idea was dropped in favour of a country house for leisure use.

For two years we looked without success for a suitable house. An optimist by nature, I never know what I want until I find it! Eventually, we received notice of a house to be sold at auction in Yorkshire. I had spent some time in North Yorkshire training with the East Yorkshire Regiment. It is a lovely and tranquil place with beautiful rolling moors and majestic dales populated with small, stone-built hamlets that convey a feeling of timelessness, with unhurried days and a natural orderliness. We went to view it, driving up the M1 to Leeds, and then the A65 to Skipton and Settle. The scenery on the drive up, with its lush countryside and pretty towns, was a perfect joy. Finally, we descended the steep, narrow road to Cold Cotes, and saw the house for the first time. It looked perfect for

our needs and, once inside, we knew we would buy it. Cold Cotes is a small hamlet of some half-dozen stone houses occupied by farmers. We spent our summer and winter holidays there for ten years. One thing I had forgotten about was the reason why the countryside was so green – rain! However, this too was beneficial, for it provided an opportunity to write.

While on fine days I rode the motorbike, which I had taken up again especially for exploring the countryside, on wet days I wrote. Most of *The Art of Breguet* was written in Cold Cotes and almost the whole of *Watchmaking*. In addition, my half of *Watches*, written with Sam Clutton; *Clocks and Watches: The Collection of the Worshipful Company of Clockmakers*; and *Watches & Clocks in the Sir David Salomons Collection*, were completed there. This work could have been done in London, but with so many distractions progress would have been very slow.

We were very happy in our Yorkshire house, although it took a few years to become accepted in our small hamlet. News of our occupancy spread and when, in about 1975, my work featured in a television programme, we became known to a larger circle, but no one ever mentioned the programme. The Yorkshire countryman does not readily accept strangers. They are somewhat dour and hard-working, practical people and probably can't see any use for strangers. In Settle, for instance, there was a woman who had come up from London during the First World War and married a Yorkshireman. She was always known as the woman from London. Even more curiously, her daughter was sometimes referred to as the daughter of the woman from London!

GEORGE BROWN, BREGUET PROPRIETOR

By the mid 1960s I was fairly well known as a restorer of watches and clocks. Whenever I completed a complex piece I photographed it, and used the illustrations to advertise my growing skills and experience.

Breguet was my speciality. In the early 1960s I had met George Brown, then the proprietor of Breguet in Paris. Slightly reluctant at first to believe that an Englishman could have any serious horological merit, he was a little reserved. We soon got on closer terms, however, and became friends. I knew this relationship depended partly on him making a profit out of it, but I, too, gained by rapidly increasing my knowledge and being allowed access to the famous Breguet archives, which recorded the date of manufacture and sale of every Breguet watch and clock. This information was important to my personal Breguet records in that it helped to give perspective to Breguet's system of manufacture.

To strengthen our relationship, George Brown conferred upon me the title of Agent de Breguet à Paris. There had been a London agent for Breguet from 1792 until about 1920, when there had been no one else to take it on. For both practical and romantic reasons I was pleased with this turn of events. It gave me some apparent authority when speaking of Breguet, and consequently introduced me to several new clients.

It was becoming increasingly apparent that the Breguet business was rather shaky. Brown had no money to spend on watchmaking and indeed had no skilled watchmaker on the premises. His one employee was very competent at repairing, but that is a different skill. He badly needed someone to take over and run the business, and I knew he had me in mind. He first suggested it in 1967, when he came to London to see a copy of a Breguet clock that I had made. The form of this clock was particularly attractive to me and, with Brown's permission, I had taken measurements of an example in his shop. He admired the work and, always with an eye for profit, proposed that he include the clock in the famous books and issue a number for it, so that it would be a genuine Breguet. This was quite legitimate, and was often practised by Breguet himself, who would then sell the clock for a profit. In this case, Brown's profit would be paid by me and would equal the profit he would have made if he had bought the clock from me and sold it to a customer.

This was Brown's first visit to the workshop and he took great interest in it. At that time I was starting the manufacture of my first

watch, and he showed particular interest in this as well. But when he suggested the possibility of my making Breguet watches, I explained that it was my ambition to manufacture under my own name. I did not want to take on the name of Breguet, for that would have meant burying my own name under the Breguet mantle. I put it to him that much as I admired Breguet, who was a direct inspiration for my determination to make my own watches, I was, in the modern context, inclined to prefer 'Daniels of London' to 'Breguet of Paris'. We both laughed over this conceit, but he knew I was serious about it and the subject was dropped. At that time I was preparing a book on Breguet's works and continued my visits to the Place Vendôme. Brown remained friendly and we continued to exchange information. When necessary I would undertake a repair or restoration for him, so our relationship was mutually beneficial. Of course he adored Breguet, and we spent many hours discussing his work, but he knew nothing of watchmaking, and so from the practical aspect could not add much information. However, he gave me complete access to the ancient books which give details of the construction of Breguet watches, with the names of the workmen and the dates. This was very useful in putting Breguet's philosophy into perspective.

My book *The Art of Breguet* was published in 1975. It is now in its third edition and has been translated into two other languages. George Brown died before it appeared.

THE ART OF BREGUET

Collecting the photographs for *The Art of Breguet* entailed many thousands of miles travelling with Leica and tripod. Often the watches needed dismantling to reveal their hidden secrets. This was always accompanied by a certain amount of anxiety lest I had an accident, and this anxiety extended also to the owners, who were concerned for their watches. But I had worked hard in the preceding years to establish a reputation and publicise my name. People are more trusting if they have a familiar name to deal with. *Watches* had been published in 1965, and authors are usually credited with some

authority and expertise. In addition, I had been appointed Resident Consultant to Sotheby's auction house in 1969, so watch collectors were also familiar with my name through the salesrooms. (This familiarity was beneficial in making watches available for photographing prior to sales.)

A Leica camera with an F2 Summar lens is not ideal for photographing watches. Before I undertook my first photographic trip to Europe I practised hard, and learnt how to adapt the camera to my requirements. A small extension tube was made to allow close up work. The camera was set up on a small tripod and the exact position of the watch determined with a plumb line suspended from the centre position of the lens. I used four 60-watt bulbs for lighting, and always used the same aperture and film speed. Three exposures were made for each shot, and there was always at least one good exposure. Hundreds of exposures were required in all, and it would have been beyond my means to employ a professional photographer. What is more, watches are very difficult to photograph, and just being a professional is not always a sufficient qualification for success.

In any case it would be impractical to take along a photographer each time a watch turned up, and photographers tend to use powerful lamps which heat the watches and can cause enamel dials to crack. Sometimes considerable tact is needed to get the picture one wants, and on one occasion I spent four days in a collector's house in Switzerland photographing thirty watches. The owner fancied himself as a photographer and had fifteen cameras of one sort or another to back up this belief. He decided my Leica was quite unsuitable and insisted his triple extension bellows camera would be better. In fact, it would have been, if there had been time to fuss over every shot as he found necessary. But there wasn't, and I insisted on the Leica, while assuring him that his pictures, when he took them, would be better. I finished my work in three days and had the film developed to check the results on the fourth day. My collector was still working when I left, and he never did send any photographs.

In addition to the photographs in *The Art of Breguet* there are some 100 line drawings explaining the function of the various

mechanisms. It was my intention to have these done by a professional draughtsman but again, the cost was going to be prohibitive. I set about doing the work myself and soon found it to be an enjoyable task; certainly much more fun than taking photographs.

At about that time, the Sir David Salomons collection, which included some of the rarest Breguet watches and the unique Marie Antoinette watch, was taken to Israel and deposited in the L.A. Mayer Memorial Institute of Islamic Art. Sam Clutton and I made the strongest possible noises to stop the watches going, for they were essentially European and had no Middle Eastern content or relevance. Presumably though, some sort of diplomatic pressure was involved, because all entreaties to keep the watches in England fell on deaf ears. Soon after their arrival the director of the Institute, one Gabriel Moriah, wrote to enquire if I would write a catalogue of the collection. Naturally, I was delighted to have the opportunity to photograph the watches and include them in *The Art of Breguet*.

So I went to Jerusalem, where I had not been since my army service in 1946. Apart from some handsome buildings that were new to me, not much seemed to have changed. I spent four days there, photographing and making notes. The photography was rather difficult at first because the staff photographer was in command. It was quite plain that the pictures were not going to be satisfactory, and I had to use all my diplomatic skills to take over the work in order to be sure of getting what I wanted first time. When this was done, the watches were examined and notes were made of their details for captions to be written. An Armenian watchmaker, Ohannes Makarian, was employed at the Institute, and he had very intelligently examined the watches and produced his own captions. They were in rather mixed-up English and to satisfy all concerned I corrected them rather than re-write them. Makarian's behaviour during my examination of the watches was very amusing. He clearly didn't trust me (Armenians are not noted for trusting others) and sat watching me like a hawk to see if I damaged anything. Occasionally, I would pretend I couldn't open a case or make the watch function correctly. Makarian's face was a study as he fought to prevent himself from taking the watch off me to deal with it himself. But that

would have been too impertinent, considering that he had been told that I was the master! Sometimes I asked for his advice, which he gave with great charm, showing how much he wanted to be part of the proceedings. On top of this, Moriah was keen for me to see the sights of Jerusalem, but my principal concern was to get my pictures and return home. With so much interference I was getting a bit irritated, and let it be known that I wished to be left alone to finish the work.

The catalogue of the Salomons collection took some seven years to complete. Soon afterwards, the whole collection was spirited away one night when the security system failed. The important thing was to have the photographs of these important watches, including the Marie Antoinette, Breguet's most complex watch, which he described as a monument to horology and without which *The Art of Breguet* would not be complete. The watches have never been seen since, and my photographs are all that remain for students to examine.

Some months later I received a letter from a firm of American solicitors claiming to be the Trustees of the Salomons collection. Could I tell them if the catalogue contained reference to everything in the collection, and would I be sure to advise them if any of the watches turned up. My reply was short and sharp. As Trustees, they should never have let the watches go to Israel, and if they really were Trustees they would know what they had been entrusted with, and could compare their inventory with the catalogue. As to the possibility of their reappearance, I told them, if they did eventually appear on the legitimate market, which was possible, then I would prefer to buy them for my own collection. I heard nothing further from them.

It was a considerable relief to hand *The Art of Breguet* over to the publisher. I would rather make a watch than write about it. But the book represented fifteen years of study of Breguet's work which, if it hadn't been recorded, would have faded from memory, and been lost to those students who may never have the same opportunity to examine so many examples.

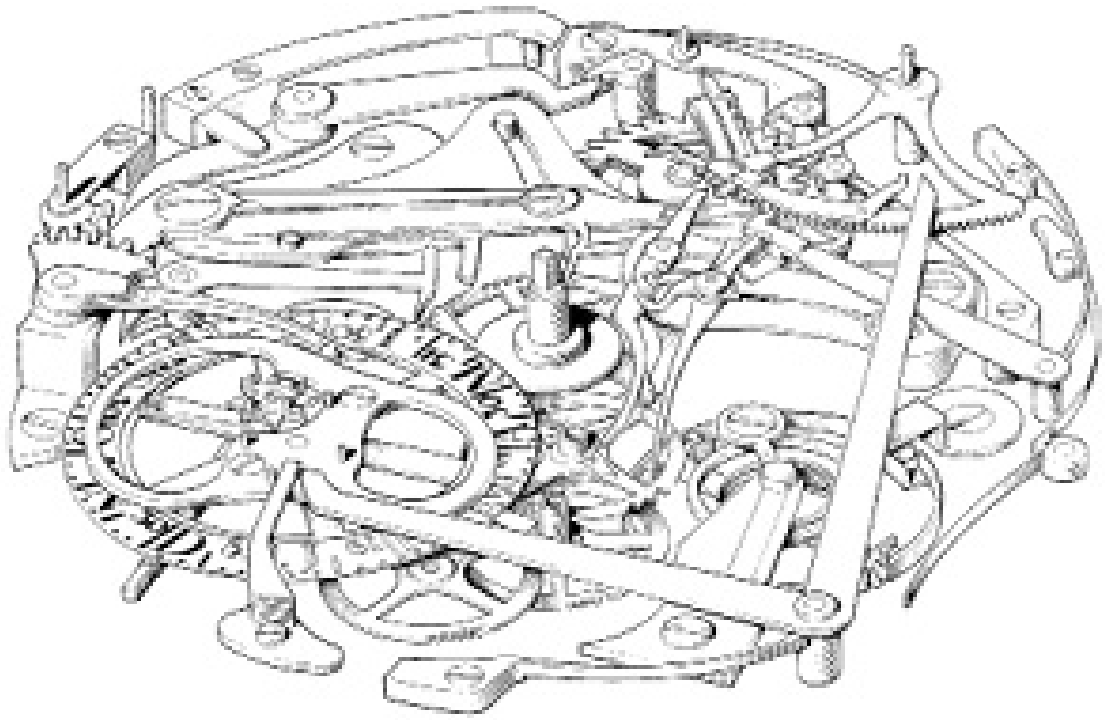
By the time the book was published in 1975, Breguet watches had become so valuable that collectors, afraid for the security of their collections and for the safety of their families, withdrew into anonymity and kept their collections secret. It may be that it will, in future, be impossible to advance the practicable study of antique watches, and especially Breguet watches, simply because of their value. It must also be said that present collectors are not so much connoisseurs as investors, and have little interest in the underlying art.

My principal concern in writing the book was to pay tribute to Breguet, from whose works I had learnt enough by 1969 to be convinced that I could start making my own watches. What Breguet had done with such apparent ease surely could not be so very difficult, I thought, although I was aware that Breguet had the services of some one hundred men in Switzerland and France who could demonstrate the highest skills in every department of watchmaking. By comparison, I had limited experience and would need to develop skills in case making, dial making and original design. But these were not matters to dwell upon. The difficulties could be overcome as they presented themselves. I was eager to start work.

In writing the Breguet book I became acquainted with Sir Francis Watson, Keeper of the Queen's Furniture. He was most helpful in obtaining pictures of the royal Breguets. Thus my Leica found itself in Buckingham Palace! Sir Francis was eventually to write a review of the book for the *Financial Times* and to my great pleasure he wrote most fully and appreciatively of it, including the remark: 'Daniels is a mechanic and revels in it.' If one is a mechanic one may as well be recognised as one.

Sir Nicholas Goodison, then chairman of the Stock Exchange, a prominent antiquarian and my wife's stockbroker, also reviewed it appreciatively, and later introduced me to Prince Charles at a Stock Exchange dinner. The Prince suggested that a cuckoo clock which sounded canonical hours might help people stay awake in church. I have a vague recollection that a prominent person had been seen to doze off at an important service. I am still thinking about the clock.

The publication of *The Art of Breguet* coincided with the completion of some treatment, started two years earlier, for tuberculosis of the kidneys and bladder. Although I had been experiencing the symptoms increasingly over the last three years, the complaint had actually started in 1949. But these symptoms, which came and went, had never been properly diagnosed, and when the cause was finally discovered in 1972 the condition, again aggravated by excessive work, was advanced, painful, and in need of prolonged treatment with drugs. The medicine was a nasty-tasting powder named Pasinah. I took it in water twice a day for two years. It worked, but I can claim some part in its success. When the treatment was completed my specialist asked how much of the medium I had actually taken. ‘Well, naturally, all of it,’ I replied. ‘That,’ he said, ‘accounts for the perfect progress of the cure. Most people only take a small part of the treatment, so the complaint is slow to eradicate.’ I had taken every revolting dose for two years! And so another sickness, aggravated by overwork, was behind me, but with no credit to several GPs, who failed to discover it and whose incompetence is responsible for the discomfort I still suffer as a result of kidney damage.



A.L. Breguet's Marie Antoinette watch movement.

6

THE FIRST DANIELS WATCH

When restoring watches one must bury one's own style and characteristics in the original maker's work. In theory, a perfect restoration cannot be detected, and the perfection therefore enhances the reputation of the original maker. I wanted to make a name for myself not as a restorer of other makers' work, but as a conceiver and maker myself. This could only be achieved by manufacturing my own watches. I had no training as a watchmaker, but for that matter I had no training first as a repairer, and then as a restorer. Thinking over the many important pieces I had worked on, it occurred to me that I had made most of the components in a watch without having made all of the components for one watch: my own. Thus the first Daniels London watch was born out of a form of apprenticeship serving the great masters of the past. I was resolved to join them, but this would mean making every part, including the case, dial and hands, and every screw, jewel, spring and wheel.

This was a task the past masters had not been called upon to do, for the watchmaking industry had then been sub-divided into many specialised parts. No maker had to make every component and, excepting for the great names such as Mudge, Arnold, Earnshaw and Breguet, who set the standards with original work, makers merely finished specialised components and put their names to the completed watch. Even the great names employed others to work for them and follow their instructions. When one realises that it takes some two thousand hours to make one watch by hand, it is obvious that to produce even a small number of watches each year

requires many assistants. But I was not concerned with quantity. My intention was to revive the manufacture of high-grade watches in London, and this required only one person. The fact that no other person in the world was doing such work made the prospect more exciting and success more essential.

I knew that design would be an important part of the first watch. It could not look like any other watch, nor be seen as a copy of another watch. A good watch has historic, intellectual, technical, aesthetic, amusing and useful qualities. In addition, the design must be both pure (that is to say, it should not be exaggerated for its own sake) and practical, so that it is easy to use and maintain. Maintenance is important; a handmade watch is expensive, and purchasers do not expect it to need servicing, except at long intervals.

My first watch had to be accepted as a work of art in its own right, as an artificial object of original conception, constructed with integrity, that would intrigue, amuse and educate the human mind. And if it was to attract the connoisseur who for sixty years had been deprived of the opportunity to buy a handmade London watch, it had to have some special mechanical interest. The electronic watch was gaining ground rapidly in the 1960s and manufacturers were claiming it as the watch of the future. The mechanical watch, they said, would die before the end of the century. I did not believe this. Indeed, I saw the electronic watch as the spur to a renewed interest in the mechanical watch.

In order to make the movement attractive mechanically I decided to use the *tourbillon* carriage, to equalise the positional rates of the watch by rotating the escapement in the carriage once per minute. This device, beloved of connoisseurs, was devised by Breguet in 1794, and because it was considered to be difficult to make, it was not often attempted. It could not, as might be supposed, use components from modern watches, for watch components are designed and made to tolerances of half a hundredth of a millimetre, and a watch has to be made to suit their dimensions. The watch had to be wholly made in the workshop.

As to the proportions of the watch and the style and dimensions of the components, it was important that these were proportional to the scale of the whole and were homogeneous in appearance. It was equally important that the finished watch did not reflect the style of the engineer. It could not appear contrived. It could not show any signs of construction. All the components had to be flawlessly finished so that the completed watch simply existed in all its technical and aesthetic beauty without sign of contact by hand or machine. A handmade watch is more created than manufactured.

All these considerations weighed heavily on my mind when, in 1968, I started work on my first watch. My workshop equipment was just about adequate: a somewhat primitive watchmaker's lathe was the principal tool, supported by the many small hand tools that had earned me a living for twenty years. I also bought a second-hand toolmaker's lathe to assist with the plates and larger components. The engine-turning machinery given to me by the late Professor Torrens would serve well for the dial-making, once I had mastered its use. Because it was the first watch there were many problems to be overcome. There are numerous components in a watch, and each must be fashioned from the raw material. Some require several operations, and all must be carefully calculated to work correctly with other engaging components. It is a continuous process of putting aside a finished component without having the opportunity to test it until the next component is finished.

Making, as compared to restoring other makers' work, was a big step to take, but had to be done. There could be no question of failure and I was quite confident that I could succeed. I cannot accept the second-rate or mediocre, and my greatest anxiety was to produce a first watch that would make a pleasing impact on those connoisseurs who appreciated fine watches. I had Sam Clutton in mind as the purchaser – he was the most experienced and particular collector of precision watches I knew, and could be very demanding.

It was necessary that the finished watch would be quite different in appearance from the conventional watch. For this reason the hour hand had a retrograde action so that at twelve o'clock it automatically jumped back to the beginning of the sector ready to

indicate the next twelve hours. This worked on the principle that precision timekeepers do not need prominently to display the hour, only the minutes and seconds. The intertwining of the minutes and seconds circles emphasised this feature. The hands were of the utmost unpretentiousness and served simply as indicators. This arrangement meant placing the minute hand eccentric to the dial centre, a feature that made it possible to use two mainspring barrels, so improving torque and reducing pressure on the wheel train. The *tourbillon* carriage carried a pivoted detent escapement noted for its precision performance. I would have preferred a new and different escapement, but that would come 'all in good time'.

The movement was simple in layout and uncluttered by components. Most of the wheel work and all the winding work was behind the dial. Only the two barrels and the *tourbillon* carriage would be visible with the case opened. This was in stark contrast to most conventional watches which have a multitude of wheels, screws and other components deliberately scattered over the movement to give an air of complexity and vulgar value for money.

For the technical details and calculations of the movement I was for the first time able to make use of those hours of theoretical study at evening classes. Surprisingly, after some initial difficulty I could still dredge them up.

The work took two years, much of it spent practising *guillochés*, making and adapting my equipment, waiting for cutters, and just plain experimenting to discover the best and most convenient methods for speeding up future work. (To this end, the money made from the sale of the watch was immediately spent on the equipment that could have made the construction of the first watch so much simpler and quicker.) When all was made, finished and assembled, this first Daniels watch was wound up, and to my delight sprang into life without hesitation. That was exactly what I had anticipated during twenty-two months of work, but so great was my delight that I might have been just a little bit astonished!

The numerals and signatures for the dial were done by my engraver, Alan Lye, who had engraved the Breguet three-wheel clock and several other dials. For an engraver he had a most

unusual background. During the war he went straight from college into the Royal Air Force, trained as a pilot, and spent his time flying Typhoons in low-level attacks on the German defences on the north coast of France. Being of a reserved and reticent nature he was reluctant to talk about his adventures, but did mention that he had been shot down and been forced to bale out. When the war ended he had no trade, and Typhoon pilots were no longer in demand, so he selected engraving from a notice board listing training classes for demobbed servicemen, and was duly trained. Alas, twenty years after his first work for me he developed arthritis and had to give up engraving, but the dials he did for me prior to retirement are quite superb in both form and detail.

The watch movement and dial were finished in 1969. Only the case was needed to conclude the work. This had to be of the utmost simplicity, without added styling features that would become outdated and boring. The pendant too had to be simple, smooth to the touch, and had to complement the simplicity of the case. I asked A.T. Oliver, a very fine casemaker who occupied a Dickensian workshop in Clerkenwell, if he would make the case for this, and future watches. Being a typical old Clerkenwell craftsman he agreed willingly, but he had the movement for some weeks and I was beside myself with impatience. I was also very concerned for its safety, for Clerkenwell workshops were not noted for being orderly and tidy, with a place for everything. They were the haven of skilled craftsmen who seemed to be quite unconcerned with the delicacy and value of the work entrusted to them, and often left it lying about on the bench. Eventually I called upon him, hoping to see some progress. None had been made. He was busy doing other work, he said, and it could be some weeks before he could start on mine. Seeing on his bench some of the same work that had been there weeks earlier, I concluded that even when he eventually began on mine it would be many weeks before it was finished.

So I came up with an alternative plan. I asked if he would he let me make the case myself in his workshop, under his supervision, and pay him as if he had done the work. To my great relief and surprise he agreed, and we there and then settled on a sum for a

week's tuition. I started the following Monday morning at eight o'clock, and stayed each day until five o'clock. Our arrangement was that Oliver would tell me what to do and I would supply the materials and do the work according to his advice. He stuck firmly to this plan, and only once very nearly picked up the work to demonstrate something difficult to explain. But he checked himself before he could commit the Clerkenwell sin of doing something for nothing for an alien. Certainly, when I wasn't exactly following his advice he would explain most carefully, and I would have to do the job again, but he was careful not to do anything to the case. For my part, I had no difficulty with the work but had to proceed very carefully, for a lifetime's craftsmanship is not acquired in a week and I didn't want the humiliation of making a mistake while under the instruction of the man who was undoubtedly the last of the artist-craftsman casemakers. To prove I could show a little individuality of thought, I fashioned some of the components in a manner to suit myself, and to my surprise he was pleased, and remarked upon it.

The case was finished on Friday evening. It had taken me five days. It remained only to have it assayed and hallmarked, and have my registered mark in the form of my initials stamped into the back. The assay was completed on the following Monday, and the first Daniels case was finished and ready for decoration and use.

Two more weeks were to pass before the watch was finally completed and brought to time. It was a signal moment of achievement for me, and the months of anxiety and concern about the final appearance and performance of the watch melted away. It met with a first-class reception from all who saw it, and so my belief in what I was doing and my confidence in my ability to do it were greatly strengthened.

The watch was sold to Sam Clutton, who had been warned that he had been chosen to be the recipient of the first Daniels watch. I knew his views would have a profound effect on my future, but I was confident he would like the watch. He wrote of it later:

> Through vintage motor cars I knew George Daniels before his meteoric entry into the field of antiquarian horology. His

virtuoso restorations quickly earned him an international reputation second to none. Then one day he announced to me that he was going to start making watches and that I was to have the first fruit of his efforts. I found this at once deeply flattering and slightly alarming as such a watch must obviously be very expensive and I was not at all sure I could afford it. However, it was no moment to argue.

Mine has a pivoted detent escapement, and mightily elegant and brilliant in action it is – power is provided by two going barrels. The balance is uncut steel coupled with a palladium spiral spring with overcoil, and an adjustable isochronal stud to check excessive arcs. It is an arrangement which produces a very fine rate by any standards.

The unusual engine-turned silver dial achieves a great height of elegance, with its sweep-centre minute hand and sector hour hand, which moves only at the hour. Having reached the end of the sector at I it flies back to the I at the other end of the sector.

Another feature of my watch not found in any others by Daniels is a case of gold and silver. The bands are gold with a silver rib between them, and the back is also silver. The whole case is exquisitely engine-turned.

Apart from apprentice test-pieces, it is probably over four hundred years since anyone made every bit of a watch himself. In my watch Daniels had to make everything himself, even down to the screws. The only things he did not make or execute himself were the balance-spring; the mainsprings; and the engraving on the dial and movement.

To do this he had to learn all the skills which used to be practised by scores of individual outworkers; not least case- and hinge-making and engine-turning. He had never made a watch-case before mine. It is a task whose magnitude would intimidate anyone, whatever his basic training. There is perhaps no one else alive who could have carried it off with the brilliance of George Daniels.

> That one man could have the intellectual ability to design such a mechanism; the technical ability to execute it with an exactitude second to almost none of the great masters of the past (perhaps only excepting Louis Berthoud); and the artistic ability to endow it with such a strikingly elegant appearance; seems an almost incredible assembly of talent and perseverance.
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> I regard myself very honoured to own this very historic watch. It was completed and hallmarked in 1969 with, of course, the casemaker's stamp 'GD'.

Sam was pleased with the watch and carried it in his waistcoat pocket every day for several months. He never wore a wristwatch and always carried two watches in his pockets. He was the perfect recipient for the first watch, showing it and discussing it with everyone of importance in horology. This soon brought enquiries from other collectors so that I was able to lay down movements for six more confidently. The movement was modified to take account of the lessons I had learnt from the first watch, and these watches were a little thinner. Each in turn was fitted into a smart royal blue box with the signature embossed in gold and containing a compartment for the certificate bearing details of the watch and its date of sale.

One of the first of this series of six watches went to Edward Hornby, a friend of Sam Clutton, who had introduced me to him in the early 1960s. In those days he had, among other collectible interests, a large and varied collection of watches. He was by nature and habit a gentleman. He was well-connected, well-off, very intelligent, and had a flair for striking the right note at the right time in the money market. He was a founder member of *New Scientist*, a magazine launched to publicise scientific advancement following the last war. It is typical of Edward's progress through life that his interest in amateur photography began when he and a senior air-force officer friend from the early days of the war were invited to establish a reconnaissance section for analysis of photographs and debriefing of pilots.

He was, socially, an ideal recipient of a Daniels watch, for it was important that my customers were socially well-placed so that the watches would receive public recognition. His interest in watches was principally aesthetic. He took only a passing interest in the mechanism, but was always very interested to experience something new. He was much taken with the quartz watch and had several examples. Their timekeeping was phenomenal and he casually remarked to me that my mechanical watch would not do as well. Of course, he well knew that the two were not to be compared. The quartz watch depended upon its battery, which sooner or later would commit suicide, whereas the mechanical watch runs for a minimum of ten years, but needs winding each day. The Daniels watch proved that it could run to within a half second per day, and these early watches, now twenty-five years old, can still do it, and what is more have received no attention since manufacture. Even so, I was concerned to make further improvements to the mechanical watch, if only because it was my belief that every professional should endeavour to make a progressive contribution to his art.

A DIVERTING CONSEQUENCE OF WATCHMAKING

As a victim of a chronic bad back, I spent several days in bed suffering from the strain of moving the heavy engine-turning components. This time I had pushed myself a bit too far. Nothing had been so important as getting the machines home for examination, but the back had its revenge. After seven days it was decided that I should go into hospital for attention, where I was encased in plaster and told to come back in two weeks. With the plaster removed all seemed well and I returned home, but without the support of the plaster my back again became painful. I took to lying on the floor, which is very relaxing, and considered the problem. With the plaster on, my muscles had deteriorated and so I had become dependent on it. With it off, my muscles soon tired and made life uncomfortable. The principle of the plaster is to make contact at three points: the front of the shoulders, the front of the pelvis and the small of the

back. By this means it prevents the trunk flexing forwards to stress the damaged muscles. But it also prevented flexing in any other direction and so the muscles didn't get any exercise. My solution was to make a stiff wire frame to fit my torso, with an adjustable strap to pull into the back. With this three-point restraint my body could flex in all directions except forward. Because it was open on all sides it did not irritate the skin and, being quickly detachable, could be applied only when necessary, so that my back muscles could regenerate with exercise. It proved an instant success and quickly solved my back problem whenever it arose, which it did less and less frequently.

I discussed the possibilities of the brace with my friend Dr Joe Briggs, who became very enthusiastic about it. I took out a patent for the brace and together we set about marketing it. Several dozen examples were made and taken to Ipswich General Hospital. The new orthopaedic surgeon was a friend of Joe's and had agreed to try out this unorthodox method of relieving back pain. It was something of a shock to be told by Joe that he must get back to his own practice in London and that I was to be left in charge of fitting the braces to the patients. There was nothing for it but to put on the conventional white coat and go at the job with apparent confidence born of experience, and hope for the best.

The first patient was a fat little bricklayer who complained that the brace was uncomfortable and prevented him from bending down. He demonstrated that he couldn't reach his shoes. I explained over and again that the principle of the brace was to prevent him bending forwards but to allow him to bend in all other ways. He didn't want to be convinced and explained that he usually had a few weeks off work when his back played up. I spent the next two hours trying to persuade patients to be receptive and to try and help themselves with the aid of the brace. Most complained that it was uncomfortable when they sat down. I patiently explained that it was designed to prevent them slumping into a chair and that sitting up straight would prevent the discomfort. Most of them hadn't any idea how to sit up straight and were clearly their own worst enemies. Finally, I was presented with a plump lady with ample chest and asked if I would

like a chaperone present. Hastily, I explained that the device for ladies was still in the experimental stage and that I could not help.

To cut a long story short, the experiment was not a success for two reasons. Firstly, the orthopaedic surgeon was offered a glittering post in Canada and abandoned the project, and secondly, the Ministry of Health dismissed the idea because it was not the work of a qualified practitioner. I lost interest in the project but kept a brace for myself and found it most beneficial on occasion, as also did some intelligent others to whom I lent it in an emergency. It really is a very sensible piece of equipment, and through it I learnt that he who helps himself will mend most quickly.

My back complaint, however, persisted and caused much inconvenience. I never knew when it would attack, and the recovery period for the muscles grew longer after each spasm. An operation called a laminectomy was available, but many stories circulated about their failures, and I was too apprehensive to risk it. But by 1983 the condition had been aggravated by arthritis, and was so frequent and inconvenient that I felt there was no alternative to the suggested operation. It was done at the London Clinic (which keeps a very good cellar!). The result transformed my life and the problem has never re-occurred. The only moment of drama was the early-morning appearance of the surgeon, who asked if I could still wriggle my toes. I could, and if he didn't actually look relieved, at least he smiled.

THE FUTURE OF THE MECHANICAL WATCH

In the 1970s I began to think seriously about the importance of making a fundamental improvement to the mechanical watch. Its survival was hard pressed by the electronic watch, which was advertised as the great breakthrough in personal timekeepers and hailed as the watch of the future. Such claims had no effect on my own market. Collectors and connoisseurs of fine and complex mechanical pieces did not want an electronic watch. They made their purchases for the pleasure of seeing the multiplicity of wheels,

springs, screws and jewels all vigorously vibrating like a heartbeat. But I was slightly concerned that I could be accused of being anachronistic, which, before long I was, in both English and Swiss journals. But I had never suggested that a Daniels watch was better than a mass-produced quartz watch. It was irrelevant to say such a thing, and in order to avoid such criticism, I had never uttered a word against the quartz watch.

The impact made on the public by the quartz watch was considerable. Examples could be had so cheaply and they kept such close time – at least until the battery ran out – that the buying public were mesmerised into believing that they really cared about timekeeping, even though, since trains only run on time in Switzerland, and airlines are universally behind schedule, split seconds are really not very important and play no part in civilised life. And in any case, it is humiliating to have a device strapped to the wrist so continually accurate that it can only draw attention to your irregularities.

In 1975 I was at a feast given by the Master of Sidney Sussex College, Cambridge, for astronomers attending an international conference. During the course of the evening I was asked by a young Polish astronomer to explain why I made mechanical watches when quartz watches were better. At that time the quartz watch was not in its present state of development and I was able to explain why mechanical watches constructed according to my designs had certain advantages. At the same time, without making any claims for myself, I managed to convince him that I had more aces up my sleeve for future development. Thus the honour of my passion was saved for the moment, but the incident made me ponder on my future plans. True, I enjoyed making watches and my customers enjoyed possessing them, but clearly that was not enough. The intellectual and aesthetic charm of the mechanical watch had been overlooked by a mere scientist who could understand nothing but technical advancement. Yet, from his standpoint, the implied criticism was valid. My task, I decided, was to develop the mechanical watch so that it could hold its own in terms of its *raison d'êtr*e, and also have a charm that quartz timekeeping could not attain.

The principal fault of the universally used lever escapement lies in the deterioration of the lubricant necessary to reduce the friction of its sliding components. I knew that if the mechanical watch was to regain its former importance to the industry then a fundamental change in the design of the escapement would be vital. There was a need for a new escapement, unaffected by the changes in viscosity of the lubricant, that could run for ten to fifteen years without extensive servicing and maintain a rate within thirty seconds a month within a maximum variation of one second per day. The lever escapement had held its dominant position for some two hundred years, in spite of several attempts to dislodge it. To find a better substitute would need much thought and experiment. But I saw the quartz watch as a serious threat to the survival of the mechanical watch, and therefore to the worth of my lifetime's association with it. It became my task to see that the mechanical watch entered the twenty-first century in a new and superior form that would underline its historic, intellectual, technical, aesthetic and useful qualities, and sustain the public's affection for it. Considering that the industry was making no attempt to find its own solution to the near collapse of the public demand for mechanical watches, my resolve was casually taken. But it was to dominate my thoughts for the next twenty-five years.

AN ENCOURAGING AWARD

In 1974 Sir Hugh Wontner occupied both the office of Lord Mayor of London and the chair of the master of the Clockmakers' Company. At that time it was the custom for the Lord Mayor to choose a recipient for the City of London Arts, Sciences and Learning Award. Sir Hugh was the descendant of a London watchmaker and was himself a collector of watches, especially those made by his ancestor. His interest in and knowledge of the complexities of the subject influenced him to present me with the award, which I received at the Lord Mayor's Banquet. This public recognition of my work was a great fillip, and exactly the encouragement I needed to

continue my self-appointed task of finding the solution to the necessity for oil in the watch escapement. (The pleasure I got from the award was enhanced when an artist I greatly admired, Jacqueline du Pré, received it after me.)

My receipt of the award attracted much attention from the newspapers. They were mildly surprised to discover that it is not essential for a watchmaker to be confined to an unwanted corner, working by the light of a naked 40-watt bulb; my workshop was, on the contrary, large, busy, and equipped with all the apparatus necessary to create a complete and original work of art. Theo Richmond, a freelance journalist and film-maker, saw an opportunity to present a human interest story about the self-taught horologist and his various interests. It was produced by the Aquarius programme of London Weekend Television in 1975, and took three weeks to complete. The twenty-minute film, shown at peak viewing time, was a most professional production by any standards. It was well received by the public and resulted in dozens of letters. I could not have wished for a better or more beneficial public relations platform.

The public has always had a strong affection for watches. They are part jewellery, part useful and, of course, a carefully selected personal choice if not a treasured anniversary gift. People who wear them regularly are lost without them, and those who live a busy life cannot plan a day without one. But their most intriguing feature is the constantly ticking, microscopic works behind the dial. This interest has led several feature programme makers to visit my workshops over the past twenty-five years. In addition to Aquarius they include Cumbria Television (c.1984), CBS News of America (c.1979), BBC Clockwatch (1999) and both national and local radio features. Whether or not this attention has brought any specific benefit I'm not sure, but it can do no harm to know that the public is not disdainful of one's efforts, and apparently would like to know more.

THE FIRST DANIELS LOW-FRICTION ESCAPEMENT

By 1974 I had completed designs for a new form of watch escapement to run without need of lubrication to the impulse pressure surfaces. (The viscosity of the oil varies according to temperature and natural ageing; as a consequence, the timekeeping of the watch becomes erratic.) Soon afterwards I met Seth G. Atwood of Chicago, a collector of both old and new timekeepers. Atwood's interest in horology had started rather late in life, but he made up for this by developing a passion for the subject that quickly blossomed into a profound and enthusiastic desire to found a Time Museum in Rockford, Illinois. He set about this task methodically and most successfully, but at the same time he cultivated an interest in modern developments and encouraged the making of modern clocks and watches. I had already restored antique watches for him. My biggest task had been the restoration of Breguet Sympathique No. 128 with watch No. 5009. The Sympathique was comprised of both a clock and a watch, and was unique to Breguet. There are two types. In the first, the watch was placed in a cradle of the clock at night. The clock would set the watch to time and regulate it while its owner slept off his evening's festivities. The following day he removed the watch from the clock and had only to wind it. In the second, later type, the clock would wind the watch as well.

Atwood's Sympathique was of the second type. I had located the piece in Paris through a French antique dealer. The whole self-winding mechanism was missing, probably because, as so often happens with complex mechanisms, a repairer couldn't reassemble it properly. But only a half dozen or so Sympathiques were ever made, so Atwood was pleased to be able to purchase it. My task was to replace the whole of the mechanism while filling all vacant holes and without making any new ones. At that time, I was filled with a passionate love for Breguet's work and was at the peak of my understanding of his philosophy. The work presented no difficulty and was tremendously enjoyable.

Atwood was pleased with the work, and in 1974 asked if I would make a watch for his Museum. He wanted some innovative feature that would enhance its performance as a timekeeper. This was the moment to start thinking seriously about a new form of watch

movement that would sustain a close rate for a long period – for a pocket watch, this meant fifteen to twenty years. What is more, I was then financially in a position to set aside all other work and concentrate on this important project. The designs had been started some four years earlier. They were based on my interpretation of Breguet's abandoned escapement with two escape wheels. Breguet's two wheels were geared together with one driving the other. Mine had separate wheels, each driven by its own train of gears and separate mainspring. Atwood was delighted with his purchase, and it occupied a prominent position in his museum.

Atwood's watch, which needed no oil to the escapement, was a very successful design. Even now, over twenty years later, it can still put up a good performance. Sam Clutton, who loved plenty of wheels in a watch, was most interested and wanted one. We agreed that I would buy back his *tourbillon* (the first Daniels watch) and supply him with an example of the new system. He took delivery a year later and was delighted with his complex purchase. I sold the *tourbillon* for a handsome profit, and so for making one watch made two profits. Interestingly enough, a large part of Breguet's business was conducted in the same way. I was, after all, his devoted admirer! I repurchased and sold this watch for a profit twice more in later years.

Soon after receiving his watch Sam spent thirty days in Tokyo. When he returned, the watch, which had been carried in his waistcoat pocket, was less than one second slow. He was as delighted with this performance as I was. This was most beneficial to me, for he was very aware of the difficulties of developing new watch mechanisms and wanted to bring the performance of the watch to the notice of the Clockmakers' Company, of which I had been appointed a warden that year.

The watches were in effect two movements with a single oscillator. Each escape wheel impulsed the oscillator, or balance wheel, at alternate vibrations to produce the effect of the detent escapement but with two impulses per oscillation as with the lever escapement. Thus it combined the best qualities of both lever escapement and detent escapement. Making such watches is an

enjoyable and satisfying exercise, but it is not strictly concerned with the further development of the watch. Rather it is what is nowadays called lateral thinking! But it was an essential exercise for me, because the success of the escapement had induced a certain self-satisfaction that had blocked forward thinking. The construction of the two Space Traveller's watches (as they came to be called) had introduced a period of tranquillity and relaxation without anxiety about the success or failure of the results. I already knew they would be good timekeepers. Thus, while making the watches I could think subconsciously about the next stage of development of the escapement. I had learnt this technique at evening classes. I was not good at mathematics but found that in the process of getting on with practical work the means of solving the mathematical problem would emerge 'all in good time'.

STAGE TWO OF THE LOW-FRICTION ESCAPEMENT

My new plan was to have only one escape wheel, but at the drawing board I found that this would not produce the perfect result. Two wheels, however, one above the other, would, and without taking up more area. It would be called the 'co-axial escapement'. I immediately began work on a watch that would use this escapement. It was made pocket size to avoid the extra anxiety of working to wristwatch dimensions. I had never made a wristwatch and didn't think this was the moment to start. The components would have needed to have been very small for a watch of, say, 30 mm diameter. If one considers a pocket watch of 60 mm diameter and a wristwatch of 30 mm diameter, then the wristwatch is one quarter the area of the pocket watch, and the manufacturing tolerances are much smaller. For this degree of accuracy a special machine is needed, and at that time I did not have one. In any case, I preferred pocket watches. They are easier to examine and more entertaining than wristwatches, and I had developed my own methods of working to close tolerances on that scale without special equipment.

The finished watch performed well, and was soon adjusted to within one second per day rate and within 0.2 seconds per day variation. It should be noted that the mechanical watch will show a different rate for different positions of running and must be adjusted so that the rate is the same in all positions. In addition it must be adjusted to correct for changes of temperature and the variation of mainspring force that occurs as the mainspring runs down. These factors do not affect the quartz watch and, since I was bent on prosecuting the virtues of my own watches, I knew comparisons would be made. It was, therefore, essential that the new watch, with its solution to the oil problem, should show an improvement over a conventional mechanical watch and generate some attraction that the quartz watch lacked. Its merit at that time was that it would run without attention for a minimum of ten years and, for the connoisseur, the entertainment of a beautifully complex mechanism.

I used the watch myself for two and a half years and monitored its performance carefully. It proved to be a remarkable timekeeper with a stability of rate that a watch with oiled lever escapement could not match. Sam Clutton, who took a close interest in everything that went on in my workshop, was very impressed. He was a most careful assessor of the performance of watches and I was pleased to have his confirmation of the daily rate of the watch. He and our mutual friend Lord Harris, both past masters of the Clockmakers' Company, had combined their horological experience to assess my work during the preceding years with a view to a nomination for the Tompion Gold Medal, which had not been awarded for seventeen years. The Tompion committee, under the chairmanship of the Astronomer Royal, agreed to accept the citation for study, and the wheels were put in motion.

At a time when sales of quartz watches were rapidly overtaking those of mechanical watches, and the general consensus was that the mechanical watch was finished, the committee was slightly nonplussed to be asked to consider the old-fashioned art. The study of the citation, which referred primarily to the invention of the two new escapements and their performance, took some eighteen months of meetings. Finally it was decided that the watches must be

put to independent tests by a competent examiner. Consequently, two watches were delivered to the Chronometer Department of the Royal Observatory at Herstmonceux, East Sussex, where they were received by Bill Roseman, head of the department, and put through a series of tests over many days. These included temperature and position tests at twenty-four-hour periods and intermediate tests to check the rates within the twenty-four-hour periods.

Both watches had been in use for in excess of two years and because they had been opened and examined many times during that period, would be expected to need cleaning before being subjected to such close testing. But it was a feature of the development of the escapements that they were impervious to conventional lubrication problems and would perform successfully for ten-year periods without attention. Obviously, if the presence of foreign matter in the mechanism interfered with its natural function then the performance might be impaired. In fact, the watches performed very well. The greatest variation between positions was within 1.6 seconds while the rate in any position was constant. This latter test was important in demonstrating the stability of rate of a mechanism after prolonged use and without preparation. In his report, Bill Roseman commented on the unprepared condition of the watches and pointed out that even with watches specially prepared for testing, it was very rare to find a watch capable of similar performance.

Several more watches were made with this escapement. They proved to be excellent timekeepers with very steady rates. In 1978 I made a wristwatch with this arrangement. It was a large, thick watch of the type used by astronauts on the moon landings. I still have it, and its performance after twenty-five years, without service, endorses the philosophy behind the escapement.

Believing now that the escapement would be a success in production as a special, precision watch, I showed it to the Swiss technicians. They were generally indifferent to it. It had clearly never entered their heads that a new escapement might offer a new hope to the mechanical watch industry, then hard pressed by the quartz revolution. It was criticised for its thickness at a time when watches

were becoming thinner, and fashion was the motivation behind each new offering. I had intended only to reveal the principles of the mechanism as an encouragement for the industry to experiment, but it was plain that the technicians did not want to understand the escapement, or the necessity for it, and used its thickness as an argument against its use. This was discouraging but, to the industry, a convenient criticism, for it avoided further discussion.

THE TOMPION GOLD MEDAL

The award of the medal was announced at the Audit Court of the Clockmakers' Company on my last day as master and my first day as deputy master in 1980. It was presented on the company's 350th anniversary at the Livery Dinner in May 1981 by the Duke of Kent.

It was a singularly important day for my horological aspirations, which were, simply, to re-establish the artist–craftsmanship industry in London while introducing new techniques to improve the mechanical timekeeper. Here was evidence based on the decision of an independent body that the enterprise was succeeding. There were some formidable names in the committee including Prof. R.V. Jones, wartime scientific advisor to Churchill; Dr Louis Essen, inventor of the first atomic clock; and Maj. R.A. Fell, former head of the National College of Horology. The award was much publicised in the trade papers, and was followed by further awards from the USA, Sweden and the British Horological Institute.

I was particularly pleased to have the fullest support from Professor R.V. 'Reg' Jones, whose wartime exploits included the discovery of the Knickbein radio direction beams, the importance of which needs no elaboration from me. Major Andrew Fell was his wartime assistant and it was through him that I met Reg. Both had a lively sense of fun and enjoyed telling stories of their more irresponsible activities, while at the same time making a serious contribution to the science of defeating the enemy. It was a great source of pride to me to share their company and enjoy their complimentary interest in my work.

One of Reg's pastimes was playing the mouth organ, and he always carried one in his pocket ready for any opportunity to play it. We played duets whenever we met, which unfortunately was not very often since he lived in Aberdeen and I lived on the Isle of Man. On one occasion, with Derek Pratt and Andrew Crisford, I drove the 1907, 10.6-litre Daimler to Aberdeen, where we met Reg for a splendid party with whisky, mouth organs and highland pipers to while away the night. The following morning one of the pipers was discovered sleeping on the village green, but none the worse for his night out. The last time Reg and I met was again in Scotland, when I arranged a party to celebrate his receiving the Order of Merit from the Duke of Edinburgh. Then aged eighty-six, he had declined to go to London. We went up in a Bentley Continental and had a most enjoyable evening which concluded, naturally enough, with a mouth-organ duet.

The late Andrew Fell was known to me through horology and my attendance as an evening-class student at the Northampton Polytechnic, where he had been head of the newly founded National College of Horology. We 'working-class students' of the old building would doff our caps when passing their college, in mock salute of the superior education that the National College students received. As the head of the college, Andrew was master of all he surveyed, and set up the necessary workshops and formulated the curriculum. It was a tough curriculum, for he was a trained physicist and mathematician. He could not tolerate any standard that was not at the top of horological science.

Fell had a robust and powerful physique that was matched by his personality. Things were either right or wrong. If one didn't agree with his views he would simply switch off his interest in the conversation. On the only occasion I experienced this characteristic I knew it would be unconstructive to pursue the matter further. Adopting my early boxing lesson experience, I retreated rapidly while still maintaining an air of confidence. He had poor judgement of human nature, and assumed his fellow men to be as incapable of deviousness as he was himself. He enjoyed drinking and did so excessively, although remaining absolutely steady, clear-headed and

sober. Those who could match him drink for drink most easily gained his trust. While he would never betray them, the reverse was not always so. Being somewhat apprehensive about his business acumen I avoided collaboration with his various ventures, although the subject was broached from time to time. He had a most inventive mind but was more artistic than practical. This, combined with his belief in his own judgment and his enjoyment of the more social aspects of business, made steady advancement a chancy affair.

In his last years Fell lived in Majorca, where he made his final horological piece in the form of a solar/sidereal clock. He wrote to ask permission to use the train calculations that I had myself used for a similar project. I replied that he was free to use any of my designs and if he could commercialise them he was free to do so. This is the answer I usually give to such a request. When patenting an invention I do so only to protect my priority of use and to avoid indiscriminate commercial exploitation. His understanding of mechanics was highly stimulating and he became a leading intellectual horologist by force of circumstances that will never arise again, for there is now no industrial manufacture of watches in England and technicians are no longer in demand.

Such men were among the outstanding individuals of horology, men with whom one could discuss ideas and projects in a constructive way. All now, including Sam Clutton, are gone. I was particularly sad when Sam died. He was an amusing companion and would call on me two or three times a week, always curious to know what was happening. He was devoted to his parish church, where he played the organ and was also responsible for its restoration. In addition he would polish the brass, sweep out and generally keep the church and grounds tidy – although he had held several important positions in life, he never shirked a menial task.

Some eight years after Sam's death it occurred to me that there was no evidence that he had ever cared for the church. It was as if he had never existed. The church had been willing to take whatever had been offered but quickly forgot the giver when he could give no more. Discussing this with a young organist, Philip Rushforth, who had been a close friend of Sam's, we concluded that a plaque would

be in order. Immediately I set about to have one put up in the church. Being a simpleton where church matters were concerned I couldn't know that the enthusiasm of the Parish Church Council, the Wardens and the Vicar, were of no consequence to the church, and carried no weight at all. After two years of correspondence and discussion with the higher echelons of the church, I settled for a plaque on the organ casing prominent to the congregation. At the same time, I founded an Organ Restoration Fund. Sam's name is now remembered and the church benefits from the organ fund (see plate 70).

7

DEVELOPING THE CO-AXIAL ESCAPEMENT

Over the following years I worked some ten to twelve hours each day, making watch movements with experimental escapements. The first pieces were pocket-watch size and were run in metal boxes to test their performance in different positions and temperatures. When, after many years, the experiments were finished, the dials and cases were made and the watches sold. Except for Seth Atwood's watch, I never accepted a commission. This would have meant making a watch to suit a customer who, when faced with the bill, might not have the cash available. As a consequence, I know I acquired a reputation for being autocratic in my choice of customers, and it is true there were some people whose patronage I did not want. But as I could make only one watch a year they were not readily available, and I needed to choose carefully who would receive them. They were my ambassadors, and it was most important that they encouraged wider interest in my work. I stuck to this principle until the early 1990s, when I agreed to supply a near-completed watch to a collector who had complained that I had refused to make him a watch. I broached the subject to him (which made me feel I was trying to sell him something) and said there would be a watch available within a few months. When the moment came he found himself a bit short of cash and declined to buy it. This was most humiliating. It was something I had always avoided in the past, and something that I never allowed to happen again.

To sit at a bench with familiar tools and fashion some raw materials into a virtually living object is a pleasure that most would

enjoy but few can attain. I am fully aware of my good fortune. Lord Harris once sat next to me at the bench and gazed in silent fascination as I worked on his watch. His parting words were: 'If I could change my position for yours, I would do so at once.' It is nevertheless hard work and most taxing to sit, near motionless, for long hours. Watches cannot be made by working conventional hours, and great application is required to keep the work progressing. But still, the bench is mentally relaxing, and the results are a joy to experience.

EXAMPLES OF WATCHES MADE 1970–1999

Some of the watches made during this experimental period are illustrated here. These include examples such as those in plates 36, 44, 45, 63 and 64, which were made partly for exhibition but mainly because I could not stop myself making them once the idea had germinated.

The differences in the details of the watches are not readily seen in photographs, but each escapement is specifically designed to test a particular aspect when the watch is both static and in general use. Often the difference is so small that optical equipment is necessary to see and measure it. This is because very small changes in angles and dimensions can have a disproportionately large effect on the performance of the watch. Watch escapements, especially wristwatch escapements, have minute components and are very sensitive to modifications. Each change needs extensive testing with and without lubrication to be sure of its reliability and stability of action. The testing of the first escapements took place over many years. The first co-axial wristwatch was kept in use for twenty years. Now that I am familiar with the requirements, possible problems can be anticipated and avoided. Depending upon its design a watch escapement will tick between 500,000 and 700,000 times every day. The reliability of the tiny components, and the utmost attention to detail in their manufacture, are essential.

Plate 63

Chronograph wristwatch, four-minute *tourbillon* with Daniels co-axial escapement, Invar balance spring with terminal curve free sprung, chronograph set into the plate to avoid increased height to the movement. Silver dial with subsidiary dials for continuous seconds to the right, chronograph seconds with minute indicator to the left, reserve of winding sector above, gold hands.

This watch is from the mid 1990s, and in addition to its co-axial escapement it is an experimental chronograph. The conventional chronograph mechanism occupies the whole of the back plate of the movement which increases its thickness. By compressing it into unused space to the side of the escapement the thickness is reduced. This watch also represents the wristwatch period, which was essential if I was to capture the attention of the Swiss industry. The addition of the complex chronograph was simply to add interest to the watch so that attention could be directed to the escapement.

Plate 36

Watch with one-minute *tourbillon* with fifteen-second remontoir, two-armed carriage, reversed spring-detent escapement, stainless-steel balance with recessed screws, Elinvar balance spring with terminal curve, silver engine-turned dial with sectors for equation of time and state of winding, gold hands, engine-turned gold case.

This watch was an experiment to establish the timekeeping requirements of watches that were to follow. The timekeeping of a watch varies with the running down of the mainspring during the day and with changes of position and temperature. By introducing a small subsidiary spring to be wound at short intervals of time by the mainspring, the force at the escapement can be made uniform throughout. By means of this remontoir, the principle cause of variation can be eliminated, making other inequalities easier to locate and correct. This watch took over twelve months to make but the information it provided made future regulation much simpler and quicker to achieve.

Plate 32

One-minute *tourbillon* with Earnshaw spring-detent escapement, three-armed carriage, stainless-steel balance with eccentric weights for regulation, Elinvar balance spring with terminal curve, silver engine-turned dial with retrograde hour hand, blued-steel hands, gold engine-turned case. 60 mm diameter.

The watch is the same in appearance as the first watch made for Sam Clutton in 1969. As described earlier, it is simple in appearance and makes no concession to style or fashion. It is intended to meet the minimum requirements for a precision watch in the simplest form of case. The dials are all of silver, engine-turned to emphasise the separate areas, some with gold inset chapter rings. All the numerals and signatures are hand-engraved so that in years to come, as with traditional antique dials, they can, if necessary, be restored. The style of the hands was determined in 1968 and has remained unchanged since. It is flattering that at least two Swiss companies have copied these hands. The cases are engine-turned, some later ones are plain.

Plate 64

Wristwatch with one-minute *tourbillon* with Daniels co-axial escapement, balance with eccentric gold adjusting weights. Invar balance spring with terminal curve free sprung. Silver dial with gold chapter rings, subsidiary dial for seconds and reserve of winding. Gold hands. Reserve dial with day and date revealed by pressing the button at eight o'clock position while the watch is carried on the wrist. Signed 'Daniels London'.

This watch was made for exhibition in Switzerland as an example of a watch with a simple, easy-to-read time dial, without the clutter that tends to make some watches look like gas meters. The day, date, and the rotating escapement, are revealed by pressing a button in the band of the case which causes the inner case to hinge out so that the reverse dial can be seen. Again, this novel approach

to the aesthetic qualities of the dial was designed to draw attention to the visible motion of the escapement.

Plate 44

Solar and sidereal watch with chronograph. Silver engine-turned dial with twenty-four-hour chapter ring for sidereal time on the left containing moon-phase disc and gilt sector showing age of the moon. Mean solar chapter ring to the right containing aperture for the calendar. Seconds below and in centre. Sector for equation of time above. Double-wheel escapement with wheels of thirteen for sidereal time and fourteen for solar time. Gold engine-turned case.

The existence of this watch is attributable to Theodor Beyer, the proprietor of Chronometry Beyer of Zurich. He is the sixth generation of Beyer watchmakers, and his son the seventh. He is a most serious collector of watches, and has two Daniels in his collection. One of these he acquired at dinner one evening in Zurich. During the course of the meal he demanded to see what I was wearing. I showed him my watch and he asked if he could buy it. It was my own watch and I declined to sell, but later he asked to see the watch again. He was adamant that he would not go home without it. I relented because the fascination of someone with his experience of watches was a compliment, and I could not refuse him. And I could, after all, make another.

Plate 45

Watch with one-minute *tourbillon* with Daniels co-axial escapement, three-armed balance with eccentric gold adjusting weights, Enlivar spring with terminal curve, minute repeating on two gongs, perpetual calendar with instantaneous change of all functions at midnight, phase of the moon. Silver dial with inset gold chapters and seconds, gold hands, silver subsidiary dials for day and month with leap year indication, centigrade thermometer.

This watch was made for the first, and only exhibition of the Clockmakers' Company in 1987. At that time I was chairman of the Horological Industries Committee and wanted to encourage individual artists to exhibit their work to the public to show that the artist-craftsman's industry still existed in England. The exhibition was an outstanding success, and attracted eighty-two exhibitors. It was my ambition to have such an exhibition every two years, but there was insufficient money and we have not held another since.

Arriving back home I was faced with the task of making myself another watch. I did not relish this because I had other, more advanced, ideas in mind. It was then that it occurred to me to make a solar/sidereal watch utilising the same principles of design but with separate calculations for each train. This was much more exciting stuff, and I set to at once to calculate the trains.

The use of a solar/sidereal timekeeper was an eighteenth-century innovation used for checking mean-time clocks. There were then no time signals and the only way to note the time was by observation of the stars. The resulting observation then needed to be converted into mean-time, which required a tedious calculation every day the star was visible. In principle, by making a watch to show both sidereal and solar time it was only necessary to observe one's chosen star and the watch would automatically indicate the mean-time equivalent. The leading exponent of the art in the eighteenth century was George Margetts, who calculated his trains to within 1.8 seconds per year. But his method made it impossible to set the watch accurately and to read the information precisely. My system provided ease of setting by stopping one or both trains independently, and freedom from backlash in the gears to prevent false readings. In addition, it had equation of time, calendar, and moon's age and phase.

I felt it necessary to improve on Margetts's error and did in fact calculate the trains to within 1.27 seconds, which was an improvement, however unnecessary. But still I felt there might be a better solution. To this end, I contacted a friend at Cambridge in the

hope of finding an horologically inclined mathematician to settle the matter so that work could start. He introduced me to Henry Daniels FRS, who not only specialised in mathematics but was an able watch-repairer and who, for good measure, was up to concert standard on the concertina. He produced a better solution within days, and modestly claimed he had found the answer in a book. His solution was within 0.4 seconds, and could be applied reasonably simply to my design.

This is the first oilless escapement watch as completed in tribute to the American astronauts moon-landing. I call it the ‘Space Traveller’s Watch’ or, in acknowledgement of Henry’s part, ‘Daniels Squared’.

CONSTRUCTION OF WATCHES

Early watches were wound by key, mainly because I do not like pocket-watch winding crowns, which tend to dominate the dial and present a heavy appearance to the case. Later watches were designed so that the pendant, also designed in 1968, can be used for winding. It is pulled up to engage the winding mechanism and pulled further up for the hand-setting position.

With the exception of the mainspring and hairspring and the engraving of the dials, every part was made by hand, without assistance, in the workshop.

The construction of a watch starts with a drawing of the dial, to fix the position of the pivot for the hands. The escapement also needs to be drawn, so as to ensure maximum efficiency of engagements of the components. For the remainder I find it necessary only to visualise the watch in three dimensions as if it were an object in my hand. If, occasionally, some dimension must be fixed, it can be arrived at on the back of the traditional envelope. Breguet preferred old playing cards.

The flawless finish of the components can be seen in these plates, as can the fine detail of the engine-turning and engraving. The quality of the finish is traditional in watchmaking, and it is a

matter of pride that every part is completed to the utmost integrity of function and finish.

EXPERIENCES IN SWITZERLAND

My attempts in the 1970s to interest the Swiss industry with my escapements led to some curious and disappointing experiences. The first concerned the Longines Watch Company. I had long been an admirer of Longines watches and have an early example, beautifully made and finished, in my collection. Through the president of the Swedish Watchmakers' Society, who was an agent for Longines, I received a letter of introduction to the head of the research and development section of the factory. Would I visit his office when next in Switzerland? Some weeks later I wrote to say I would be in the area and asked him to suggest a convenient time for me to visit. I received no reply. From my hotel nearby, I telephoned the factory to speak to my contact. He denied ever inviting me to visit him, and refused to see me. Somewhat confused by this, I called at the factory the next day, only to be refused admission by the reception desk, which was familiar with my name and so had been advised of my coming. I was obliged to leave without seeing anyone of importance. When I spoke to my Swedish friend later he merely explained that the Swiss factories were very close and secretive in their dealings with outsiders, and refused to believe that anything worthwhile could be invented outside of the Swiss industry. Presumably, my contact had been ordered not to allow me in.

On another occasion I had a letter from Portescap, makers of escapements. They had devised a form of lever escapement which gave a constant force of impulse to the balance wheel, irrespective of the force available from the mainspring. Being a lever escapement, of course, it suffered from the usual lubrication problems. I presumed they were interested in exploring the possibility of utilising my escapement. With my wife, who speaks excellent French, we arrived for an interview. We were shown into a large room with a long table and some thirty chairs around it, and sat

where indicated. After a few moments, as if at a command, some fifteen white-coated men arrived, each carrying a clipboard with attached papers. Their leader rose and made a long speech which, as far as I could understand, pointed out the superiority of their methods, which had culminated in a complete solution to the lubrication problems. I felt it would be polite to congratulate them on this success and asked if I could see an example. A brochure was produced which illustrated the constant force escapement I was familiar with. I attempted to mention the problem with regard to the lever escapement and introduce my solution. My mentor simply repeated his speech. Thinking I might have misunderstood something, I asked my wife's advice. She assured me I had heard correctly. I tried to discover what purpose there was in my presence, and it was explained that it was important I understood the superiority of their solution. This was baffling, because they had no solution to the problem with which I was concerned. Presumably, their object was to get me to accept that their work was so good that there was no point in my believing there was any purpose in pursuing with mine. There was no point in continuing this one-sided discussion, and we left puzzled and disappointed.

On another occasion I received a letter from a firm of escapement-makers from whom most Swiss watchmakers buy their escapements. I visited the factory with some drawings and an example of a pocket watch. The drawings were received with interest, but it was felt that the manufacturing tolerances would be too tight. In any case, they did not make pocket-watch escapements, and for a wristwatch escapement the problems would be greater. This was perfectly reasonable, but I had supposed that they would concern themselves more with the principles of the mechanism rather than with its difficulties, which were a matter for a development engineer.

Back in London, I fitted an Omega wristwatch with the escapement and returned to the factory with it. They were interested, but criticised its size (it was a large thick watch, of the type carried by the US astronauts on the moon). Again, I referred back to the principle; the size was only a detail, especially to a factory so

experienced in mass producing tiny components. I was, however, encouraged by the opinion of the chief technician, Roland Dubois. He agreed that the principle was good, and said that he would like to make it. The single snag was that he wanted an order for half a million pieces! Because the principle of operation was accepted as good, I hoped he might find it useful to advise the watchmakers who used his conventional escapements. He clearly was not interested in doing so, and once again I left disappointed.

PATEK PHILIPPE

The next approach was from Patek Philippe, the most prestigious watchmakers in the industry. Their English sales director, Alan Banbery, himself a skilled watchmaker trained at the Geneva school, had earlier expressed an interest in the first oilless escapement with two escape wheels. In 1979 he saw the prototype pocket watch with the co-axial escapement. I had earlier applied for a patent for this, and was thus able to send him some sketches. With his chief of research and development he visited my workshops in London to see more of the escapement and study the manufacturing details. After some discussion it was agreed that Patek Philippe would undertake to make some prototypes to evaluate the efficiency of the escapement. Work started in February 1980. My prototype was a pocket watch and Patek Philippe, who manufactured every type of watch, planned to build pocket-watch prototypes.

These were to be produced specifically for long-term testing under severe conditions, including artificial ageing, whatever that may be. In view of the performance of my own watches, this all seemed to me to be rather laboured. It was as if there were unknown factors that needed experiment to test their worth. From the beginning I sensed a slight air of antagonism in our discussions. But if I had been an employee under the scrutiny of my superiors with a foreigner interfering in my workshop I knew I, too, would feel rather prickly, so consequently I kept a low profile and spoke only when asked a specific question. By correspondence, and my visits to

Geneva, we resolved several problems and I encouraged the technicians to change details where their experience of calculated conclusions was applicable. Sometimes, to flatter them, I asked for advice in order to show appreciation of their undoubtedly superior technical education. They gave their answers grudgingly, as if to avoid improving my education. On the one occasion that I lunched with them they spoke rapid French so that I was rather left out. When I did reply, they couldn't understand a word I said. Certainly my French is poor, but I don't usually have any difficulty in getting my message across. Our meetings were all a little edgy and I felt unpopular.

Eventually the awful and, I felt, inevitable moment arrived. A year and more had passed and the first prototype was ready for me to see. It was, as one would expect from Patek Philippe, beautifully made. But it was prone to stop occasionally, especially when moved about. In fact, it stopped there and then as I looked at it. They were obviously aware of the fault, for someone prodded the movement with a long point, whereupon it sprang to life again. I could see from the drawing where the fault lay, and gently pointed out the incorrect line which had caused an error in the component. The result was unexpected; the draughtsman looked at his watch and hastily departed saying he had another appointment, while his chief advised me that it was not a mistake but a deliberately applied different philosophy of design.

I did not enjoy my visits to the factory. Primarily because they obviously resented of my presence, but more depressing was the realisation that these men were essentially technicians who had no love of the romance and intellectual pleasure of the conception, design and construction of a beautiful and original work of art. To them, watchmaking was a practical way of making a living, and the less original thought required, the easier the work would be. If they saw any merit in my escapement they were certainly not going to admit it to me, nor, for that matter, to themselves. I knew these were not the people to develop the escapement, but I could not pull out and I had nowhere else to go. Therefore I had to stay with it and hope that professional pride would force them to succeed.

Becoming impatient to make progress I suggested that the way forward was to concentrate on producing a wristwatch. This would appeal to a greater market than a pocket watch. Of course, it would be more difficult, but if successful, the extra work and expense would be worthwhile. The chief was in full support of this suggestion and produced the latest Patek Philippe self-winding movement of only 2.5 mm thickness. This was quite unexpected. I had visualised a larger watch, something after the style of the Omega I had converted. Such a watch would appeal to people who needed a precision timekeeper, and who saw a prominent watch as a token of their serious use of its performance. That was my original intention for the escapement. I never had imagined it would fit into a thin watch intended mainly as a fashion ornament. The chief was equally sure that the escapement would not fit into his watch, and I realised that I had been outwitted. If it couldn't be used for modern watches, then what was the point of further experimental work? He didn't actually ask the question, but handed me the movement, which I took back to London for examination. It was obvious that the escapement could not be fitted into the space available, so I put it to one side and got on with other matters. I felt despondent about the whole exercise, for it had taken some fourteen months to get to this impasse and I could see no solution to the problem. By nature an optimist and by practice an opportunist, I did not cast aside the project, but waited to see what the subconscious came up with.

Two weeks later I felt that curious feeling of slight elation and relaxation that precedes the arrival of the solution. This involved a fundamental change in the design of the co-axial escape wheels, the number of teeth being reduced to eight. The escape-wheel pinion was dispensed with while the upper escape wheel was redesigned to act as both pinion and escape wheel. By this means, one component was dispensed with and the height of the wheels was reduced by a half, from one millimetre to a half millimetre. This modification allowed the wheels to fit neatly into the existing available space. I was elated to be in receipt of this solution to what had seemed an insoluble problem.

Converting it into a working escapement would tax my equipment to the limit, for the components were tiny. The upper escape wheel, for example, was now only 1.2 mm in diameter. This would have to be made within tolerances of five thousandths of a millimetre for diameter and concentricity, but these limits would be an enjoyable challenge with much to learn in the process.

To achieve the required limits I looked about for a precision drilling and measuring machine. These machines, called jig borers, enable work to be done to tolerances of the order of 0.001 mm. They are not commonly in use and so are difficult to find. I was most fortunate in finding an excellent example, complete with all fittings, at a reasonable price, and so was able to start work almost immediately. The escapement was designed, made and adjusted to working condition in three weeks. It was a hugely rewarding moment to see the balance spring into life and, more particularly, to know that I had outwitted the chief of Patek Philippe research and development. All the physical and mental strain and all the resultant anxiety fell away and were forgotten. I had never previously worked to such a scale – the components were so small that they were difficult to hold without causing damage. The jewels for reducing frictional contacts were so small that they were not only very demanding to cut but could easily be lost or broken in the process.

As with all handmade prototypes, each component was fitted to shape and needed continuous fitting into the movement to assess the effect of each alteration. It was a very tedious process at such a small scale, and each fitting offered the possibility of accidental damage. I did not enjoy the work. There was always the possibility that the completed escapement would not work satisfactorily. If it looks likely to work on the drawing board, then it should function when made. But would it work well, and efficiently? Its future depended on this, and it was important for my professional pride that it did. Such anxieties are enervating and combined with fourteen- to sixteen-hour days can be exhausting, but it has been a feature of my life’s work that failure is unacceptable and success is everything. Now another hurdle had been overcome. Would the R&D department of Patek Philippe adopt the same philosophy? As

requested, the movement was taken to R&D in Geneva. It was examined with close interest and I thought I detected some admiration for the solution. It was agreed to make three prototype escapements to fit into their movement.

The process of setting up to make the components was prolonged, for special cutters and tools were needed. Swiss technicians do not make components by hand methods, although only a few pieces are required. As a consequence much time is lost in setting up and making the necessary modifications.

The drawings were discussed at some length and agreed upon with one exception. I proposed a different proportion for the extra driving wheel, but my suggestion was rejected in favour of the theory of Defossez, who had written the Swiss technician's bible, *Théorie générale de l'horlogerie*. In disagreeing with them I chose my words most carefully, for Defossez's words are sacrosanct and I didn't want another difficult atmosphere to develop. But it was my escapement and I would stand or fall by their interpretation of it. It was crucial that we started out on the right note and I was insistent on stating my objection. I knew my method was better and in the end I was obliged to explain clearly that Defossez was a theoretician, and that some of his theories were generated and not acquired by practical experience. My solution, however, was based on practical experience. Though it was different from his, it obviously worked, so why change it? But my advice was set aside as technically incorrect.

By early 1982 my own prototype, complete with case and dial, had been produced by the factory and was in daily use. Indeed, it remained in use for the following twelve years and has been set aside now only because the self-winding mechanism failed. That it should have lasted so long without servicing is a tribute to Patek Philippe's design and production of so slim and delicate a movement. It was important that the escapement performed well for at least ten years without attention and so the watch itself was deprived of service. The escapement is still in excellent condition and with the same balance amplitude to demonstrate its contempt for lubrication.

By 1984 the R&D prototypes were not running well and one had been sent to a specialist escapement maker for analysis. The report was very critical of the escapement, and in particular mentioned the prime fault of the gears which I had discussed at the beginning of the project. I received a copy of the report, which made depressing reading. I sent a letter to the examiners pointing out that the example they had examined was not made by me, and did not represent my design or methods. Only the conception and principle of design were attributable to me, and my own work demonstrated the success of the system. I expected their comments to be strictly confidential and would take immediate action if my reputation was in any way affected by it. Their reply was most affable and complimentary of my work. My letter was attached to the original report to ensure confidentiality, and for all I know it is still there.

Only a final meeting with R&D remained. During it I wore my Patek Philippe prototype and, in my pocket, the original pocket-watch prototype. The chief came to the point at once. ‘We cannot make your escapement,’ he said, and that was the end of four years of expensive frustration. Their three prototype movements were given to me. One is now in the Clockmakers’ Company collection.

ROLEX

In 1984 I was approached by the Rolex Watch Company, who expressed an interest in the co-axial escapement. I visited them in Geneva, taking with me a pocket watch, the Omega wristwatch, my Patek Philippe prototype, drawings, and rate charts of the watches.

Having gained access to the entrance hall of the Rolex building, which is of ballroom dimensions, one must then walk across the centre of the hall to a receptionist, who sits aloof at a giant desk. Since she already knew the purpose of my visit (I could not have gained entrance without her knowing), it seemed pointless to make me walk up to the desk only to be told to make my way to a seat set to one side. I was kept waiting for seventeen minutes before being ushered into the office of the chief technician. Feeling that they had

put on a good enough show of self-importance I resolved to volunteer nothing. If they wanted to know something they would have to ask for it.

I was introduced to the chief technician, a very pleasant technical services manager, and an equally pleasant head of the local technical college. Also present was the production technician, who spoke in a peremptory manner without looking at me. I guessed he was another self-adulating technician who would make no concessions to me.

In due course I produced the drawings and then answered their questions. The technician, oozing authority, pointed out what he saw as a difficulty here and a problem there, things, he said, which could affect the usefulness of the mechanism. In the ensuing silence I said loudly and clearly in my best French that difficulties were for technicians, solutions were for artists. As a profound remark it doesn't stand critical examination, but it was the best I could think of on the spur of the moment, and it had the desired object of shutting him up to such good effect that he left the room and did not return.

After that the conversation became more congenial, and the meeting concluded with an examination of the watches. There was much clearly expressed admiration, especially for my Patek Philippe prototype. They wished to borrow an example to examine and test. I suggested the Omega, which was not on extended test. I pointed out that, while the static performance of the watch was good, as they would discover, the balance and amplitude was too low – the watch was my earliest prototype, and therefore was not of the most efficient design. It was being left with them only to demonstrate the principles of its operation. In due course I was sent a copy of a technical report which pointed out that the balance amplitude was too low! I replied that I had already told them that, but with such a good performance, as indicated by the rating tapes, why were they concerned? The reason, of course, is because conventional watches need larger amplitude. The fact that mine is not conventional seemed to have escaped them. It is always difficult getting past what the other fellow knows that he knows, and in this case I didn't think it mattered very much, and I didn't try.

Some months later the same people, with the exception of the technician, visited the Isle of Man to see exactly what was happening in my workshop. I extended every hospitality and showed them around. They were clearly impressed by its comprehensiveness and by the fact that everything was made in-house and without assistance.

They studied, under the microscope and with the optical comparator, the details and tolerances of the various escapements, and concluded that the tolerances were too demanding for their production methods and that, for example, it would be impossible for them to ensure so close a fit of the pivots of the components. I had anticipated this, and was able to demonstrate that the pivots and jewels were standard production components exactly as they used in their watches.

They left on the third day impressed by all they had seen and heard on the subject of escapements. The previous evening, after a sumptuous meal cooked by my wife, who is Cordon Bleu trained, they told me their impressions. It would seem that before visiting me they had been in close touch with Patek Philippe's chief technician, whose experiences with the co-axial had influenced their negative thoughts. He had left them in no doubt that the escapement was too difficult to make successfully to the required commercial standards. What they had seen in my workshop, they now said, supported this view.

I suggested that, as a practising watchmaker, I would never undergo the humiliation of allowing it to be thought that I could not successfully prosecute my chosen profession, that I was not obliged for comments from a technician without imagination, artistry or determination to succeed. Of course, it was a mistake to say that, and it went straight back to Geneva, but I was increasingly ready to be angry with Swiss technicians.

It was suggested by a Patek Philippe production engineer that it was disloyal of me to go to Rolex after four years of Patek Philippe's time. But my visit to Rolex had been at their request, and I had made it plain that I would make no more prototypes. If they wanted to experiment they were welcome, but I could only offer advice. They

were well aware of that, and proceeded no further with their interest. In any case, the Patek Philippe technicians were anxious for me to go away and not discomfort them any further.

The five years I had spent coaxing recalcitrant technicians had been wasted, except that I had made friends among the younger generation of watchmakers, who were keen to do something important and make their way in the world. In addition to *Watches* and *The Art of Breguet* I had written a treatise on *Watchmaking* (now also available in French), and this, in a period without watchmaking schools, had been of great help to them. These students were passionate about mechanical watches and my books were the spark that lit the fuse of their aspirations. I knew that one day some of them would occupy influential positions in the industry, and that they might be influenced in their decisions by my work.

In closing this disappointing period I must thank my friend Alan Banbery for his unwavering confidence in my work and his support in my dealings with Patek Philippe research and development. He was in an awkward position: he wanted Patek Philippe to be the first to adopt the co-axial escapement, but had no certain knowledge that it would be beneficial in quantity production. This, plus the universal 'Not invented here' syndrome, made it difficult for him to press for rapid progress without giving offence to one or both parties. For four years he sat by me and gave me full support, and in 1999 paid me a cherished compliment when he purchased a Daniels co-axial watch for his personal use.

BASEL FAIR

During the 1980s I was invited by one Svend Andersen to exhibit watches at the Annual Baselworld Watch and Jewellery Show in Switzerland. Svend Andersen is a Danish watchmaker who practices in Geneva. He buys high quality movements and adds various complications, together with cases and dials of his own designs. His is a successful enterprise and an indication of the direction in which individual makers must move. To make a complete movement is a

costly undertaking and has become a specialist field. Few brand names now make their own movements. This is not significant, however, because the principles of movements and self-winding mechanisms are now well established. The quality of machining has also been developed to a point where, as with the motor car, it is virtually impossible to buy a bad example. Development and tooling costs for new designs are now so great (a consequence of the rise in the workers' standard of living), that only the largest production facilities, or the most exclusive, and therefore most expensive, makers can succeed. This has encouraged people like Svend to specialise in the finish and presentation of exclusive designs. He has gathered together several like-minded individuals in various aspects of clock and watchmaking and they meet each year to exhibit on a collective stand.

I had never been to the fair and did not have anything to sell, but I thought it might be fun to attend and see what was happening in watchmaking. Apart from my experiences with the co-axial escapement, I had no knowledge of the industry generally, and having several watches with escapements of my own design, I wanted to see what others made of them.

The fair is held in the vast Messe exhibition halls and is quite astonishing to the newcomer. Every manufacturer and anyone to do with watches exhibits there. The whole of the ground floor is laid out like one vast town of watch shops carrying every known name in watchmaking. I was so stunned by this mass of commercial enterprise that I could only thank my lucky stars that I could work alone at home in my own workshop, without any of the obvious pressure required to sell so many watches simply to survive.

My show went well and attracted considerable interest. I had been visiting Switzerland for so long that I was fairly well known and so it was also an enjoyable social occasion. The majority of visitors to the stand had never seen a co-axial escapement and it was obvious that its workings were a mystery.

It attracted a lot of attention. This was the final developed form of the escapement which would fit into any mass-produced watch and, of course, any individually made watch. If necessity is the

mother of invention then Patek Philippe had been devil's advocate. Their refusal to accept that the escapement could be successful had forced me into the programme of work that I had hoped the factories would adopt. My original intention was simply to introduce a new escapement philosophy that would encourage others to take a closer interest in precision mechanical horology. A fundamental rethink of the escapement was necessary if the mechanical watch was to recapture the confidence of the public. My system of impulsion to the oscillator would be the foundation for this. I was truly astonished that the industry was indifferent to my ideas and would return home dispirited at the lack of response. The fundamental difference between the industry and myself became apparent from my experiences with the factories. I considered it a duty to move my profession forward. They saw it simply as a living. It was this complete lack of love for the beauty of the art of mechanics that I was unable to understand. Only a complete development, ready for application, would be looked at without immediate rejection. Even where interest was shown development was not considered – it was simply too great a commitment.

After visiting a few factories, where I was always most cordially received (I had after all been visiting Switzerland for thirty years, so at least they knew that I was harmless), I realised that few companies had a full R&D division and therefore could not develop a new escapement. Most bought their escapements from a specialist manufacturer and were incapable of manufacturing them for themselves. It is a fact that the escapement is the most exacting part of the watch. Components must be made to tolerances of a thousandth part of a millimetre and these components will engage each other in their various functions at great speed some 960,000 times each day. To ensure smooth and accurate performance they must be made with the utmost care on the finest, specially constructed machinery, operated by experienced technicians. Once the machinery is set up and prepared for production the components can be made cheaply and supplied to brand makers who are not encouraged to spend money experimenting.

For the 1986 fair I built a large working model of the escapement, electrically driven to run for the duration of the exhibition. Radiating from it were six pale-blue ribbons, each terminating in a wristwatch movement containing a co-axial escapement. These were by Omega, Rolex, Patek Philippe, Zenith, Jurgensen and Daniels. The two Daniels movements were made specially for the exhibition; one had a four-minute *tourbillon* and newly patented chronograph mechanism, and the other had a one-minute *tourbillon* displayed in the crystal back so that, in idle moments, one could observe the escapement in operation. The display was designed to show that the escapement could be fitted into both production and individually made watches. It attracted many visitors, especially the makers of the displayed production movements, which were raised on supports with a magnifying glass above to make viewing easier. The factory technicians would peer closely through the glass at their particular make while, at the same time, avoiding eye contact with me. No one spoke to me about the exhibit and so I learnt nothing of their thoughts, but there was no doubting their curiosity.

The work had taken three years to complete, and in the years following I carried the watches wherever I went, exhibiting them whenever an opportunity presented itself. In addition to Basel, watches with explanations of the Daniels philosophy were exhibited at Garrard's, Goldsmiths' Hall, the Clockmakers' Company, the British Horological Institute, the American Watchmakers' Institute, Bobbinet Precision Watch Gallery, La Chaud-de-Fonds Museum and Horological Centre, and the City and Guilds of London. I took every opportunity to bring the work to the notice of anyone who was potentially interested. Comments and articles were published in every important watch magazine, as well as *Country Life*, *Debrett's Guide to the Season*, two Sunday colour supplements and several overseas magazines. Much interest was generated, especially through the Swiss magazines read by the new generation of younger watchmakers.

For detailed explanation I gave lectures using animated drawings to clarify the action. The lecture programme took place

between 1980 and 1995, and included the Antiquarian Horological Society (to draw a comparison with past escapements), the Royal Astronomical Society, the Royal Society of Arts, the British Horological Institute, the American Watchmakers' Institute, the Royal College of Art, Harvard University, Cambridge Philosophical Society, Sotheby's of London, and Omega in Switzerland, New York, Hong Kong, Taiwan and London.

I began to sense an increasing interest in the escapement, especially among the new, younger and more flexibly minded watchmakers, who were increasing in numbers as the industry strengthened. My two treatises *Watchmaking* and *The Practical Watch Escapement* were aimed specially at them. The campaign was successful insofar as it made the name Daniels co-axial familiar enough to be mentioned in watch conversation without the need for explanation. By now I had made a huge investment in both time and money to achieve success, simply because there was nowhere else to go.

A lively interest was shown by the many young watchmakers whom I had come to know in my visits to Switzerland. One young man whom I had met in the trainee workshops in La Chaud-de-Fonds Museum showed a particularly close interest, and it was agreed that he would make a future visit to the workshop on the Isle of Man. Altogether, the publicity was successful in that it had generated more interest in my escapement and its potential application to the Swiss watch.

This was in distinct contrast to the earlier visits I had made to Switzerland to keep interest in the mechanical watch alive. There had then been quite a large body of opinion that had ridiculed my belief in its future. After an interview published in *International Watch* magazine in the 1980s I was subjected to two pages of criticism by a watch school professor who could see no merit in my ideas. 'Are we to throw away our vacuum cleaners and return to sweeping with brushes?' he demanded. Such were the vacuous noises made by the uncomprehending modernists, who, given their way, could have destroyed the Swiss industry. Indeed, at that time it was only some 40 per cent of its former size and there was enormous

unemployment. Because I did not hesitate to make my views known, and show my contempt for the industry's short-term interests, it was inevitable that the misguided would want to reply. But they were wrong, and they made the mistake of criticising my work and aspirations. For the first time I felt the necessity for responding to the criticism and blasted it in a two-page reply which the magazine kindly published. My professor has never recovered from his beating and with the present strength of the mechanical watch industry he has no grounds for criticising my views.

When first exhibiting at Basel, my principal aim was to support Svend's excellent venture to publicise the work of individual craftsmen. In later years, I was more concerned to publicise my own innovations, particularly the escapements. The mechanical watch industry was flourishing and expanding rapidly. An increasing number of makers were adding mechanical watches to their range of quartz watches and competition was intensifying for what was, after all, a limited market. The more exclusive companies turned to producing extra-complicated mechanisms to gain increased publicity. There being no experienced watchmaking craftsmen to make the watches (the schools had been closed since the early 1960s), computer-aided design was developed by the technicians to achieve the most sophisticated and complex systems. These could be tested by simulation on a computer screen to ensure that all worked well before any machines were set up to produce the components. For the wheels, pinions, pivots and so on, conventional means were available for production. For the mass of small, irregular-shaped components needed for minute-repeating, striking mechanisms, chronographs, *tourbillon* carriages and the like, spark erosion and wire erosion machines were made by specialist constructors to suit every requirement of the production engineer. Forty years earlier an army of highly skilled tool makers would have been needed to prepare for such productions, and the present structure of the industry is a tribute to its ability to adapt to new circumstances. I must say that when I first discovered the industry's ability to make complex watches without skilled watchmakers I felt somewhat perturbed. How would that affect the young artist–craftsman who

wanted to make an individual name for himself, but who did not have the means to purchase such equipment and had to rely on the relatively slow process of handwork to shape the components?

A close examination of the general appearance and style of much of the work reveals the distance that separates the style of the technician from that of the artist. The watches are simply not elegant in either style or proportion. The finish of the components also needs improvement if it is to equal the fine detail work of a skilled watchmaker and finisher. Finally, there is the inescapable fact that factory machines cannot economically be set up to make one component. The artist–watchmaker can not only make a single component, but he can reject it and make another more suitable or more elegant one once he has assessed its qualities. Thus, the artist-craftsman of the future will not be replaced by a machine. His work will be slower to complete, but he has only himself to sustain and quantity is not a requirement when dealing with the connoisseur collector. This is amply demonstrated by the present condition of the market in which several makers are now offering complex watches to a very small and unexpectedly discerning market. The watches are original only in size; the mechanisms being miniaturisations of earlier pocket watches. The reduction in size is due to the new machining techniques which would be more acceptable if the results could be made to better proportions. Unfortunately, the tolerances become very exacting as the watch grows thinner. This means that a watch made to a half diameter cannot be made easily to half thickness. As a consequence, many of the watches have a disproportionately thick and clumsy appearance.

Other watches are put at a further disadvantage by the crystal-backed cases which allow easy viewing of the movement. With an eyeglass, it is possible to assess the quality of the finish of the components, and on the whole they are not so beautifully finished as their earlier pocket-watch counterparts. This is not something that the connoisseur is always capable of assessing, but he will usually be advised by a watchmaker agent, who could be discouraging about the lack of fine-detail finish and advise against the purchase. In reducing the quality of the finish, which also can apply to the dial

and hands, the maker is often assisted by the sales staff of the retail shops. They often have no training, and are therefore unconscious of the necessity for fine workmanship. It seems to me that future sales of these ultra-complex watches will depend upon the quality of finish. The mechanisms are now almost commonplace in the luxury market, but the finish is not so luxurious. The makers who pay special attention to this feature and train their sales departments to exploit it will succeed in an over-crowded market. Such are the thoughts that occupy my mind while assessing the future of the art by observing the world's products on show to the public.

THE ADOPTION OF THE CO-AXIAL ESCAPEMENT

My final visit to the Basel fair was in 1994. I had not exhibited for two years and had no further intention of returning, but two important factors caused me to change my mind. Firstly, the young man I mentioned earlier, Kilian Eisenegger, visited my workshop in the mid 1980s. He was then working for a movement manufacturer in Grenchen. This firm, ETA SA Manufacture Horlogère Suisse, is the biggest maker of movements in Switzerland and probably the world. He was intrigued by the co-axial escapement and impressed its merits upon his seniors. Several meetings with his company followed and it was agreed that they could have exclusive rights to manufacture, with myself as the sole exception. We hoped to sign the agreement at the Basel fair.

The second factor was an invitation received via Svend Andersen's Exhibition Group of Independent Artists, as they were rather dashingly called. Would I put on a special display at the fair as an added attraction to visitors? My expenses would (in part) be paid. I welcomed this opportunity to show the latest watches and attract sales of the book I just had written on escapements. I had published this book while negotiating with ETA SA to establish the priority of the invention and development of the co-axial escapement.

The agreement with ETA SA took a year to finalise mainly because we were bedevilled by lawyers who didn't understand our

interests. I had hired a lawyer simply because I know little or nothing about business methods, and didn't want to be taken advantage of. They had a lawyer to ensure that I was bound hand and foot in their interests. After some initial exchanges I wrote a long letter to the company pointing out that I was just as anxious for them to succeed as they themselves were, but that under no circumstances could I be parted from my right to retain an interest in making my own watches with co-axial escapements. Furthermore, because they would be able to make the components by mass production methods, I insisted they supply me with a fixed number of escapements each year. That, plus a few obvious safeguards, was all I needed, and the document was ready for signing at the Basel fair. This was a most important occasion for me and, in due course, for ETA SA. They are the ideal company to manufacture the escapement. Their R&D department is huge and, in addition, the world's biggest escapement maker, FAR, is part of their group so that they have great experience in working to the closest tolerances with mass production components.

Their R&D department set to at once to prepare for making the tooling for production. But this could only be finalised after intense study of computer designs and simulation drawings. I found this rather boring because I had already completed several wristwatch escapements and knew exactly what to expect. I could see that it wouldn't be satisfactory from their point of view simply to accept my designs without exploring the basic requirements. Nor did the technicians want to feel that they were there simply to do as I instructed. This was particularly applicable to my young friend Kilian, who had accepted responsibility for drawing his superiors' attention to the merits of the escapement. His was a position of considerable responsibility. From his deliberations would come the drawings for the manufacturing tools. It would be a most expensive waste if they were not correct.

At a first meeting to discuss the ways and means of producing watches with co-axial escapements I was introduced to all concerned. It was very pleasing to note that they were not concerned with making prototypes. Clearly, they were confident enough to go

straight for production. I had earlier given them a movement fitted with the escapement. This had been the subject of intensive study and testing in the research and development department and the test results had been most encouraging.

Much admiration was expressed for the ‘genius escapement’ and I felt very optimistic for speedy progress after so many years of frustration and failure to produce results. But I had not realised how cautiously slow production engineers can be. The cost of making tools is high and mistakes are expensive to rectify. Therefore certainty of conclusion is necessary before the instruction to proceed can be given.

The component dimensions are determined by CAD. The geometry and proportions of the components can then be settled by interaction of the images on the screen. This approach to design is a wonderland to me, but apparently essential to a production technician. It enables many different arrangements to be examined before finally fixing the required data for production. Copies of all designs and modifications were sent to me and, whenever necessary, I would visit the factory to offer advice or discuss progress. Such details as shapes of jewels, wheel teeth, tolerances, balance and lever angles, elevation clearances of the components, depths of lockings, types of metal used and so on, were continuously reviewed. I now have a pile of drawings some 20 cm high. This contrasts dramatically with the few sheets of foolscap and the backs of old envelopes that I have previously used.

Meanwhile, components were made to the drawings by wire erosion; assembled as complete movements and fitted with dials, hands and cases ready for testing. Some were worn by members of the staff (I was also given one) while others underwent static tests in the laboratory. The static testing is an alarming succession of violent shocks at the rate of eighty per minute. This is to ensure that the components are not subject to unwanted contact that could affect the reliability of daily rate while being worn on the wrist. Mobile tests are made with the watch rotating continuously to check the rates in positions.

The testing continued for two years while other examples with modified components were produced for further testing. To my mind such prolonged testing is unnecessary. Either the design is correct, in which case the watch will run correctly, or it is incorrect and the assembled components will immediately reveal their errors. But there is a lot at stake with a new product, and makers are very concerned to protect their names from possible criticism.

The relatively low balance amplitude of the test watches was the subject of some criticism. When freshly cleaned, the lever escapement, which the co-axial was to replace, has an amplitude of some 300 degrees, but this will fall as the months go by and the oil deteriorates. Therefore a high initial amplitude is necessary. The gradual fall from high to lower amplitude will reveal poise errors of the balance as a variable rate. The co-axial escapement maintains a constant amplitude for many years, and so does not need a high initial amplitude. For this reason I had set the amplitude to 270 degrees which falls to 220 degrees only in the vertical positions at which amplitude poise errors are eliminated. There was much discussion about this feature and suggestions that the escapement was inefficient. In fact, the lever escapement is better able to utilise the available power because it has a large escaping angle which, itself, is disadvantageous for isochronism. The co-axial utilises less of the available power but has the advantageously small escaping angle and is more efficient in transferring the driving energy to the balance. This is a net gain to produce a more stable rate.

The amplitude of the co-axial combined with stoppages during shock testing made me apprehensive about the future success of the escapement in the hands of ETA SA. I repeatedly explained the advantage of the amplitude characteristics when combined with the essential positional rate stability. It cannot be easy for a man trained to believe that high amplitude is important to accept a low amplitude as beneficial. Eventually, the rates of the watches themselves proved the point. They were as accurate as marine chronometers and ran faultlessly once the components and working tolerances were correct.

I found it very trying to the patience that each time the co-axial characteristics proved to be different to the lever escapement, its integrity was questioned. It looks different and was designed to be different simply because something different was needed in order to eliminate the principle fault of the lever escapement. The stoppages were caused by incorrectly shaped components, which I was able to demonstrate under a simple microscope. R&D seemed to believe that it was better to find out the hard way than to seek my advice. My twenty-five years of experience in making the escapement obviously wasn't sufficient to make my advice acceptable. This was the cause of much lost time.

After twenty-six months of modifications and two years of constant testing of two sets of prepared watches, all were running perfectly and keeping a precision rate of timekeeping. One set had dry, unlubricated lockings while the other had a thin film of lubricant applied to the locking faces. The unlubricated lockings showed traces of oxidation caused by the impact of the escape wheel teeth. This impact occurs 691,000 times each day and the watches had been running for two years. This caused a considerable flutter in the dovecot and led to much technical discussion as to the cause. My own belief is that the methods of cleaning the components after manufacture was too thorough and that the surfaces were too dry. This problem had been experienced before the industrialisation of the co-axial escapement with oxidation at the dry pallet pivots of the lever escapement. New cleaning methods had been introduced to meet more stringent health requirements. Prior to these new methods there had been no problems with dry pivots, therefore the problem must lie in the cleaning process.

In *The Practical Watch Escapement* I had made specific reference to the unlubricated lockings. It was not necessary to leave the lockings dry, for the escapement was impervious to the presence of lubricant. A smear of grease on the lockings could be beneficial since it would insulate the locking surfaces from possible effects of variable humidity. In any case both series of watches, dry and lubricated, had behaved impeccably, proving that the timekeeping of

the co-axial was indifferent to the presence of lubricant. And so it was agreed that all was well.

By now I was bored with the business of testing and questioning. The watches were performing impeccably and Mr Miche, the very exacting technical director of the Omega Watch Company was satisfied that all was well and production could go ahead. It was announced by Mr Sofisti, the president of Omega, that they would launch a new series of watches with the co-axial escapement at the Basel fair in 1999. This was important to me, for I had reached agreement with Omega that I could have a limited number of *ébauches* as a platform for a small series of watches bearing my own name. I had already started to make these but had agreed not to announce them until Omega were to announce their own watches. An *ébauche* is a skeleton watch movement, comprising the plate with wheels and winding work, which is ready to receive the escapement, calendar mechanism, case, dial and hands. These would be made individually in the workshop to my design.

The five years the industry spent to produce the new watches had been a most frustrating period for me. Except for the adoption of the basic geometry of the escapement my advice was not taken in the early stages of manufacture. Only after I had pointed out their errors was the design changed to follow my advice. Did they really not understand the requirements, or was it a case of not wanting to be seen to need advice from a foreigner? I shall probably never know. But before signing the contract for its industrialisation I wrote the book *The Practical Watch Escapement*, which contains a complete analysis of the conventional and classic escapements, and concludes with a detailed and illustrated technical description of the co-axial. Thus my priority of conception and design was emphasised and I presented the factory with a copy before signing the contract for industrialisation in 1994.

The press launch took place at the Omega factory in Bienne on Monday 13 April 1999. It was well attended by journalists who were to have advance notice for publication and demonstrations of the functioning of the escapement and, most importantly, would be told the reasons why it was to replace the lever escapement in the new

series. The occasion was a great success and went some way towards showing that journalists are familiar with what actually goes on inside a watch. They were intrigued with the new escapement, which, it was impressed upon them, was the first practical new watch escapement since Thomas Mudge (another Englishman!) had introduced the lever escapement in 1754. Some of the questions that followed were meant to be searching and unexpected, but after twenty-five years of use I wasn't likely to be confused about the merit of the mechanism.

The publicity generated by the press release ensured a large gathering of dealers and agents at the launch on 30 April at the Basel fair.

THE LAUNCH OF THE CO-AXIAL

The Omega stand at Basel for 1999 was impressively large and was to be the platform for introducing the co-axial escapement to the public. It would also re-introduce Eugene Cernan, the last man to walk on the surface of the moon, complete with the Omega watch he wore during his moon walk. It will be remembered that Omega supplied the watches for the astronauts.

I must say I enjoyed my introduction. Indeed, it would be difficult not to be pleased when one is introduced as an horological genius dripping with talent and praise, and whose every action brings added lustre to the art. I was well aware that a certain commercial bias was being brought to bear upon the occasion and Omega's aspirations for it, but most people would not know that, and in any case it was a sweet occasion after twenty-five years of dismissal by the self-styled captains of the industry. The general multitude applauded and looked genuinely pleased at the thought of a major change in the philosophy of design of the watch escapement.

Warming to the occasion I made a speech explaining the reasons for the invention of the escapement. There were more questions of a technical nature but these were easily dealt with. The questioners enjoyed drawing attention to their technical

understanding of escapements, and during this diversion I took the opportunity of pointing out that the co-axial escapement, in addition to its practical merits, was fashionably cleaner than the quartz watch simply because it had no need of batteries or electricity, and therefore neither polluted the environment nor consumed its resources. As a mark of the importance of such matters to the public this provoked polite applause.

Finally Mr Sofisti wound up the proceedings with a further complimentary speech implying that, together, Omega and Daniels had taken on the near-impossible by combining their practical ability founded upon 150 years of manufacture, and my technical genius to produce this remarkable contribution designed to carry the mechanical watch into the twenty-first century. It was all rather triumphant and I felt dizzy with praise, but I have to confess I enjoyed it! I was then presented with the first production co-axial watch with presentation inscription and the number 000/999.

After my previous experience with Swiss companies I did not expect to be very prominent in the launch and pre-launch publicity. I knew that my name would not appear on the watches but that was not significant. The details of the invention and development of the co-axial escapement are recorded in *The Practical Watch Escapement*. But the importance that Omega gave to my contribution throughout the launch was unexpected and very pleasing. It was therefore with genuine pleasure that I complimented the company on its determination to crack the problems of mass-production that other important companies had backed away from. The presence of such technicians among the audience was a measure of their discomfort of the failure to overcome their prejudice of foreigners with precocious ideas. I was particularly pleased to be congratulated by Philip Stern, proprietor of Patek Philippe, for whose success in the industry I have a high regard. It was a pity that his technicians didn’t relish the idea of working with an Englishman. History could remind them that the basic practical and scientific requirements of precision timekeepers were all invented by the English between 1720 and 1790.

After lunch the astronaut Eugene Cernan drove in on the moon buggy with Nicholas Hyack, who owns a very large part of the Swiss industry. Speeches were made and the famous watch was handed over to Hyack for exhibition in the Omega museum.

Gene Cernan is a most congenial man who makes conversation easy. Fortunately I had read his book *Last Man On The Moon* before meeting him, and so I was able to take an intelligent interest in what he had to say about moon journeys. There is no doubt that he is a very strong-minded and determined man as, of course, he would need to be. He expressed considerable disappointment at not continuing his space travels with a trip to Mars. I could think of no good reason for going there, but felt it inappropriate to say so. He took a close interest in the co-axial launch and, for the archive, we were photographed together both with the watches and on the moon buggy. We met several times during the week and supported each other during the sometimes tedious progress of interviews with journalists, seemingly from every part of the globe.

This public-relations exercise continued with visits to America, China, Hong Kong and several European countries, including Switzerland and England, the historic homes of watchmaking. It seems that the action of the co-axial escapement is not readily understood and the presence of the inventor is required. Thus I am offered the perfect opportunity to indoctrinate the horological world with the advantages of the escapement. What more worthwhile opportunity could a lifelong dedicated horologist wish for?

8

NOT TOO TECHNICAL

The accuracy of the quartz watch depends upon a small piece of quartz that is energised by a battery, causing it to vibrate. The vibrations are harnessed to a train of gears to carry the hands and indicate the time. Apart from the second hand there is no motion to see. The period of the quartz can be controlled to bring the timekeeping within a second or two per month.

The mechanical watch has a vibrating escapement comprising an oscillating balance wheel controlled by a hairspring. This is kept in motion by a mainspring and a train of wheels terminating in the escape wheel. Each time the escape wheel is released by the oscillator it imparts a push, or impulse, to the oscillator to restore lost energy caused mainly by its working friction. The action of the components as they engage one another causes friction, and this demands lubrication.

The lubricant is a variable factor: its viscosity changes continuously with age and variously with changes of temperature. As a consequence, the rate of timekeeping varies according to the viscosity, and the escapement needs frequent and regular servicing if the rate is to remain steady.

The ticking of the watch is caused by the impact of the escape wheel re-energising the balance wheel oscillator. In a wristwatch this occurs at each vibration, i.e. two ticks per oscillation, described as ‘tick tock’ because for technical reasons the two sounds are slightly different. The lever escapement of Thomas Mudge invented in 1754 is such an escapement.

There are some escapements that impulse, or energise the balance only at alternate vibrations. These ‘tick’ but do not ‘tock’ and therefore every alternate vibration is un-impulsed or ‘dead’. The detent escapement, invented by John Arnold in the 1770s, is such an escapement. It is more accurate than the lever escapement because the contact with the balance wheel is reduced and lubrication is not needed, so it is more stable in timekeeping. They are not suitable for use in a modern wristwatch however, because this receives much agitation in use. If the watch is agitated suddenly during the dead vibration it may stop and will not self-start.

Thus, the two basic types of escapement for watches are the detent escapement, which ‘ticks’ and can produce a precision rate of timekeeping, and the lever escapement, which ‘tick tocks’, but is more reliable and whose timekeeping is at the mercy of the viscosity of the lubricant.

It is a remarkable fact that the lever escapement invented by Thomas Mudge has sustained the industry for 200 years, and the industry has spent an equal time looking for a stable lubricant. During those years many attempts have been made to find a more suitable escapement for both civil and scientific purposes. It might be thought from the great variety proposed by both amateur and professional alike (some 200 examples are known) that there are many solutions to the requirements of the ideal escapement, but none of them has succeeded in practical use.

The essential requirements are:

1. Impulse to the oscillator at both vibrations of each oscillation.
2. Impulse delivered tangentially with minimum friction.
3. After impulse the oscillator to be free to complete the vibration without further contact with the escapement.
4. The oscillator to be self-starting while winding the mainspring from the run-down condition.
5. The oscillator to restart after being accidentally stopped.

The lever escapement fulfils points 1, 3, 4 and 5. The detent escapement fulfils points 2 and 3 only. But point 2 is the feature that requires no lubricant and which therefore offers greater stability of performance, while point 1, fulfilled by the lever escapement, offers the reliability of performance not available to the detent.

If one could produce an escapement that combined the virtues of the lever and the detent escapements the problem of the ideal escapement would be solved. In the 1970s I set out seriously to find the answer. All watches made in the workshop after 1975 were constructed as vehicles for testing escapements. And I had the satisfaction of knowing that however long the experiments might take to finalise there was a customer waiting to buy it and keep my endeavour alive.

In this respect I enjoyed the same insulation from commercial pressures that was experienced by Breguet when experimenting with new principles. But after twenty years of experimenting between 1795 and 1815 he finally gave up and reverted to the lever escapement. Since the illustrious Breguet had not succeeded there would be no great humiliation on my part if I failed. But I had no intention of doing so – there simply had to be a way of combining all the required principles into one escapement.

SYSTEM OF IMPULSING THE LEVER ESCAPEMENT

The system of impulsing the oscillator of the lever escapement requires long inclines lifted by the sliding action of the escape-wheel teeth. The friction caused by this action necessitates the use of a lubricant, without which the escapement will cease to work.

The action of the lever escapement is seen in figure 1. Impulse starts at *A* seen in dotted lines. The wheel tooth impels the pallet in the direction of *B* as it slides along the inclined surface of the pallet *C*. The length of the slide at *C* is equal to half the space between the two escape wheel teeth less only the drop of about two degrees. For a watch of some 30 mm diameter with an escape wheel of 5 mm

diameter there will be some 14 mm of sliding friction at each revolution of the wheel. Such an excess of friction must have lubrication if the escapement is to function. As a consequence of changes in the viscosity of the lubricant caused by ageing and climatic changes, the rate of the escapement will become unstable. For modern, fast-beat lever escapements grease is sometimes used instead of oil. But this also is affected by climate and, especially after a period of use, by change of humidity acting upon the impulse surface partially wiped clean by the passage of the escape wheel teeth.

By radical re-design of the impulse elements, the co-axial escapement avoids sliding action and the consequent friction so that the rate of timekeeping remains constant whatever effect the elements have on the viscosity of the lubricant.

The impulses generated by a tooth sliding along the pallet incline of the lever escapement are quite different in nature to the impulse of the co-axial escapement, in which sliding contact is minimal. As a consequence, the impulse is not dependent on lubrication, while the lever impulse will not function without it.

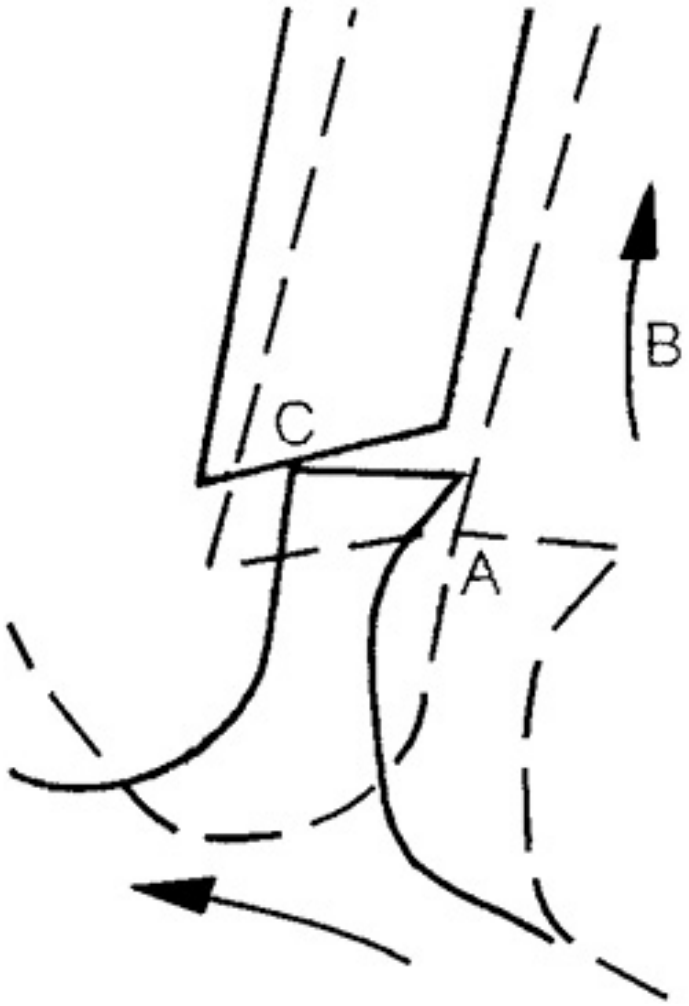


Fig. 1

SYSTEM OF IMPULSING THE CO-AXIAL ESCAPEMENT

The action of the tooth of the escape wheel of the co-axial escapement during impulse is seen in figure 2. The tooth will fall onto the impulse pallet at position *A* to impel the pallet to position *B*. From the centre line *B* of the action the tooth will recede back to the tip of the pallet at *C* to complete the impulse and fall away to lock the wheel. In a watch of some 30 mm diameter, the sliding contact of tooth and pallet during impulse will amount to no more than a few

hundredths of a millimetre or less than one millimetre per revolution of the escape wheel. As a consequence the impulse is not affected by the condition of the lubricant so that a significant variable factor is eliminated to produce a stable rate.

The form of impulse of the co-axial escapement is also beneficial in allowing a reduction of impulse angle. The angle is in fact reduced from the 52 degrees of the lever escapement to 30 degrees for the co-axial to allow considerable advantage in isochronism. Furthermore, because the balance amplitude of the co-axial escapement remains constant, the large initial amplitude of the lever escapement is not required so that positional errors are suppressed and the stability is further improved.

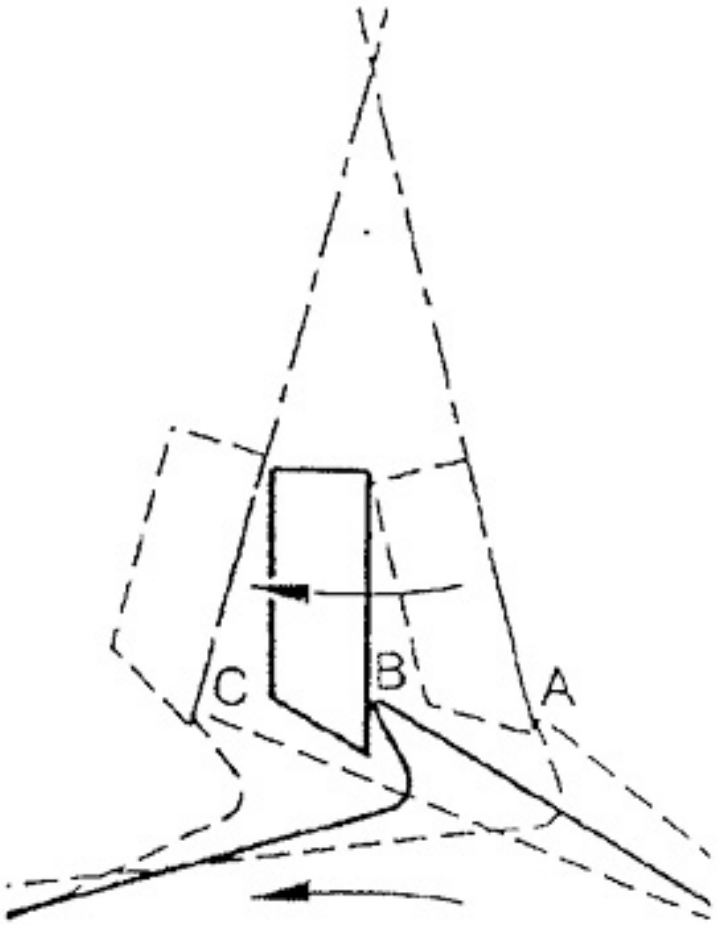


Fig. 2

EARLY OILLESS ESCAPEMENT

The first form of Daniels low-friction escapement (figure 3, below and figure 4, overleaf) employed two escape wheels side by side, both engaging the lever to impulse the single oscillator. Each is driven by a separate mainspring and wheel train. As the lever is rocked by the oscillator the wheels alternately impulse the balance. The wheel that is not impulsing during its ‘dead’ vibration is simply transferred to a secondary locking to wait for its impulse vibration. Both impulses are delivered directly to the balance with minimal friction so that oil is not

required and the rate will remain stable. As seen in figure 3 the right side wheel is impulsing the balance. The impulse by the second wheel, as the balance vibrates in the opposite direction, is a mirror image of the first.

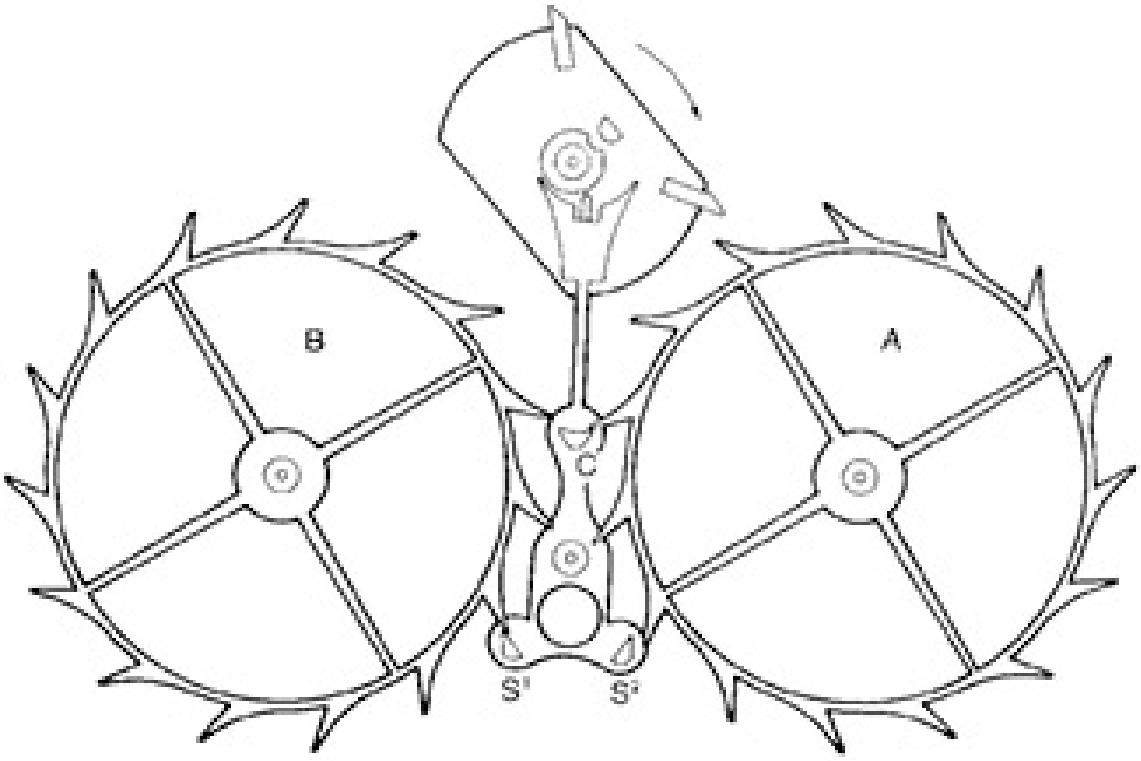


Fig. 3a

Balance turning clockwise to unlock wheel A

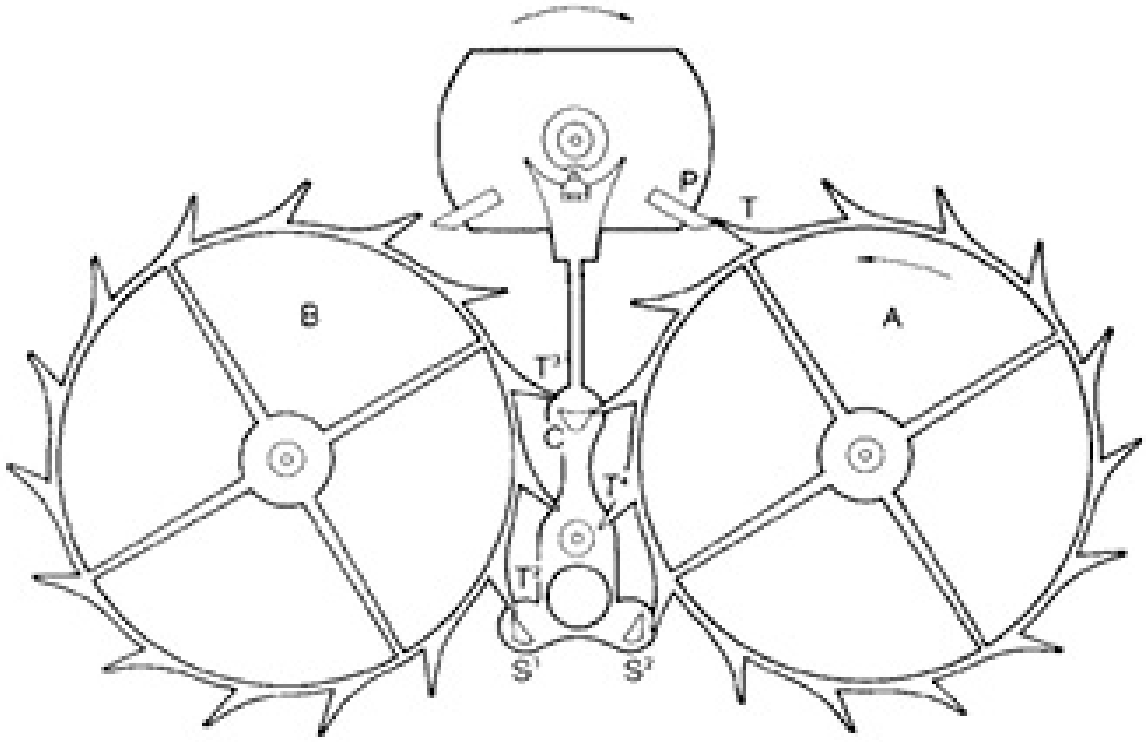


Fig. 3b

Wheel A unlocked and impulsing pallet P

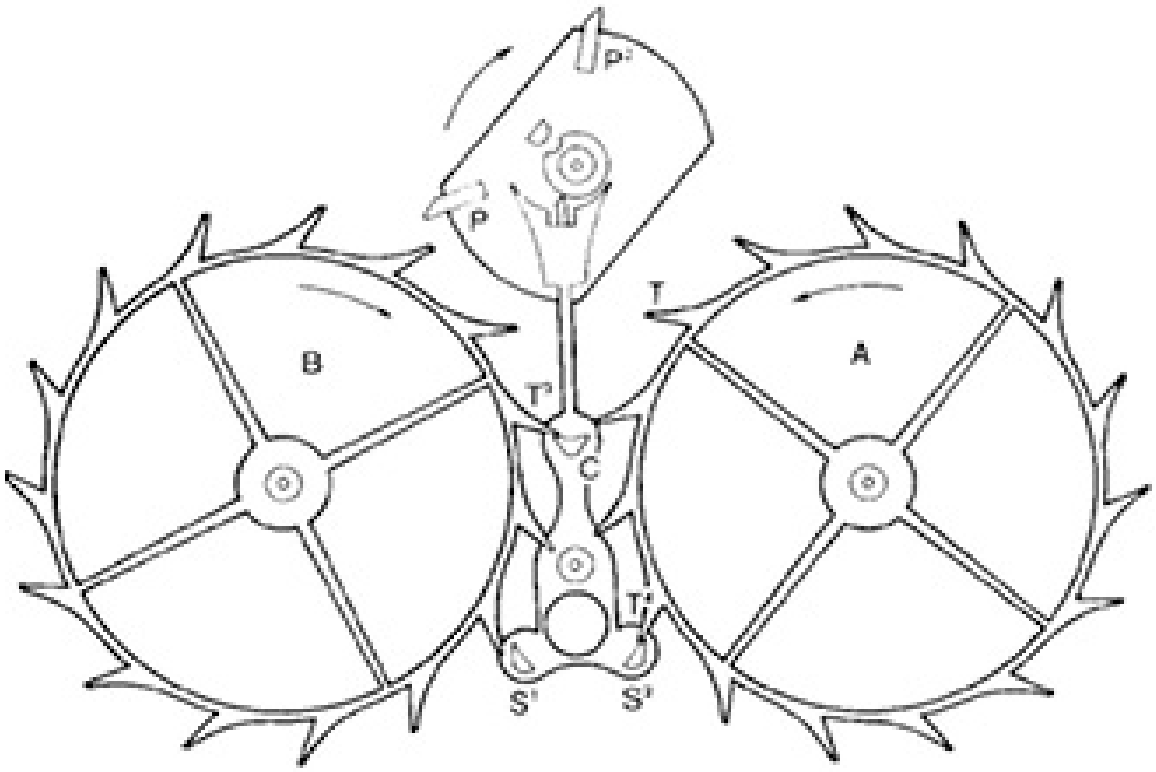


Fig. 3c

Completion of clockwise cycle to transfer tooth T3 to locking C ready for anticlockwise cycle

The escapement is in fact two pivoted detent escapements arranged to supply impulse at each vibration. The principle of the method is that the impulsed and the impulser must rotate in opposite directions during the impulse. The escapement represents a very naive interpretation of this necessary principle, but it served to demonstrate the improvement in performance that could be achieved with a double impulse escapement with minimal friction. It was one of these watches that Sam Clutton carried with him during his journey to Japan. After a month it was under one second slow. Of course, it is far too complex for industrial manufacture but rather more a delight to the collector.

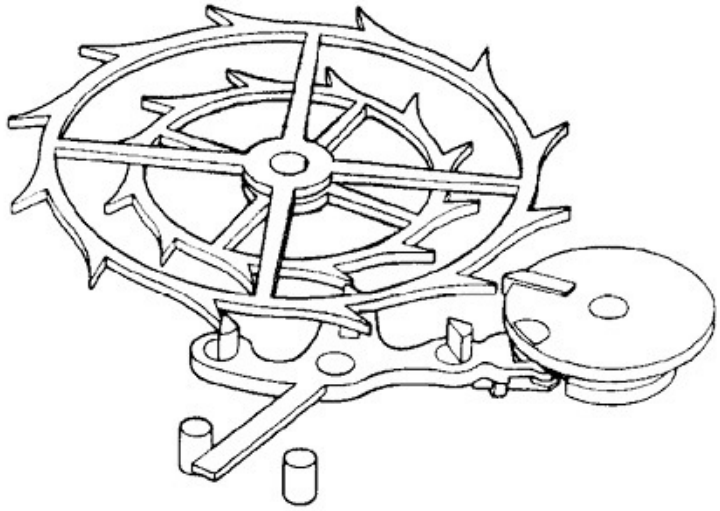


Fig. 4

Elevation of components of co-axial escapement

THE CO-AXIAL ESCAPEMENT

The co-axial escapement was invented in 1976 and patented in 1980. Instead of two wheels on the same plane it has two wheels on the same axis. As with the double wheel escapement, the impulse system has a low friction characteristic that is impervious to the condition of the lubricant. For each oscillation, one impulse is delivered directly to a pallet on the balance roller while the other is delivered to the balance via the lever fork and unlocking pin of the balance roller. This form of impulse does not require lubrication.

The principle of the impulse is as for the detent escapement, in which the impulser and the impulsed are rotating in opposite directions. When the balance receives an impulse from the escape wheel, the two are rotating in opposite directions. The escape wheel cannot now be reversed to produce the second impulse of the oscillation. But the lever is always in opposite rotation to the balance so that, when it is also in opposite rotation to both balance and escape wheel, it can deliver the impulse to the balance roller.

The system proved to be very successful in that it fulfilled all of the requirements for a modern watch escapement and is, in addition, robust in construction so that it can be dismantled and reassembled without the need for re-adjustment.

Because the balance does not lose amplitude due to oil deterioration, it may initially be set low at some 270 degrees so that when tested in the four vertical positions, when the amplitude will fall to 220, positional errors of poise of the balance will not produce errors of timekeeping.

This escapement was used, with modifications to the geometry, in several pocket watches and, in 1981, was awarded the Tompion Gold Medal for its performance as a timekeeper. This encouraged me to persist with the development work to find the best proportions for the components.

In the late 1970s it was fitted to an Omega 1041 chronograph wristwatch. This offered ample space in the movement for the co-axial, which needed extra space to accommodate the extra height of the escape wheels plus the driven pinion. The experiment was so successful that even today, after twenty years without cleaning or adjustment, it maintains the same balance amplitude with which it started.

It was essential that the escapement be reduced in height in order to fit it into the space available beneath the existing bridges. Any other arrangement would mean fundamental changes to the design of the movement which would be quite unacceptable to the manufacturer. The existing problem was the height of the two escape wheels mounted one above the other on the escape wheel pinion. These combined added up to 0.75 mm while there was space for only 0.5 mm. A further problem was the small, 5 mm diameter escape wheel for a wristwatch. The radial engagement of the components for a conventional wheel of twelve teeth would be only 0.02 mm maximum with a tolerance of only 0.002 mm if the action was to be secure. Such small tolerances would make quantity production impossible. Clearly, the existing design of the co-axial was unsuitable for application to the fashionable thin movements and I suspected that, for the future, only thin movements would be

made. Modern machinery could produce thin movements as reliable as thick movements and these could be used for thin or thick cases as fashion dictated. If success was to be achieved conventional methods would need to be abandoned, but without offending the pride of the prickly technicians.

The solution is seen in figure 5 overleaf. Here the components *A*, *B* and *I* are fitted into the existing bearings of the conventional escapement so that no alterations are necessary. The two escape wheels *C* and *D* are co-axially mounted while the number of their teeth has been reduced to eight. The consequent increase in tooth space and angle ensures a reliable depth of engagement without necessity for close tolerances. In this form and with specially designed tooth tips the small wheel serves also as the driven pinion to dispense with the height of the conventional driven pinion. The original escape wheel is replaced by the driving wheel of twenty teeth, the same number as before. By this means the number of vibrations per hour remains at 28,800. The only alteration to the movement is the simple addition of two more bearings for the lever which requires no alteration to the movement or existing bridge. The step-by-step action of the escapement is described in figures 5a, b, c, and d.

It was in this form – with a total height of 0.4 mm – that it was presented to and rejected by the industry technicians from 1984 until 1994. During that time I carried only co-axial watches of my own make as I talked, wrote and lectured on the escapement, determined that it should not be forgotten. Then, in 1994, it was Kilian Eisenegger – my young acquaintance from the watch school in the early 1980s and now employed at ETA, the escapement makers – who brought it to the attention of his company directors. They accepted his opinions and appointed him to make the tools for its production. After twenty years of undivided application it was to be commercially manufactured.

DESCRIPTION OF THE CO-AXIAL ESCAPEMENT

The escapement in figure 5 is composed of an intermediary wheel *A*, a double co-axial wheel *B* composed of escapement pinion *C* and escapement wheel *D*, pallets *E* with three ruby pallet-stones *F*, *G*, *H* and a roller *I* carrying a ruby impulse stone *J* and a ruby impulse pin *K*. The roller is fitted to the sprung balance.

It is essential that a successful escapement for use in a modern watch must transmit energy to the oscillator in both clockwise and anti-clockwise vibrations. In the co-axial escapement, the clockwise impulse is delivered to the oscillator directly by the escape wheel engaging the balance roller. The anti-clockwise impulse is delivered to the balance roller via the lever. After each impulse, the escape wheel is locked stationary by the lever-locking pallets, allowing the balance to complete its vibration undisturbed.

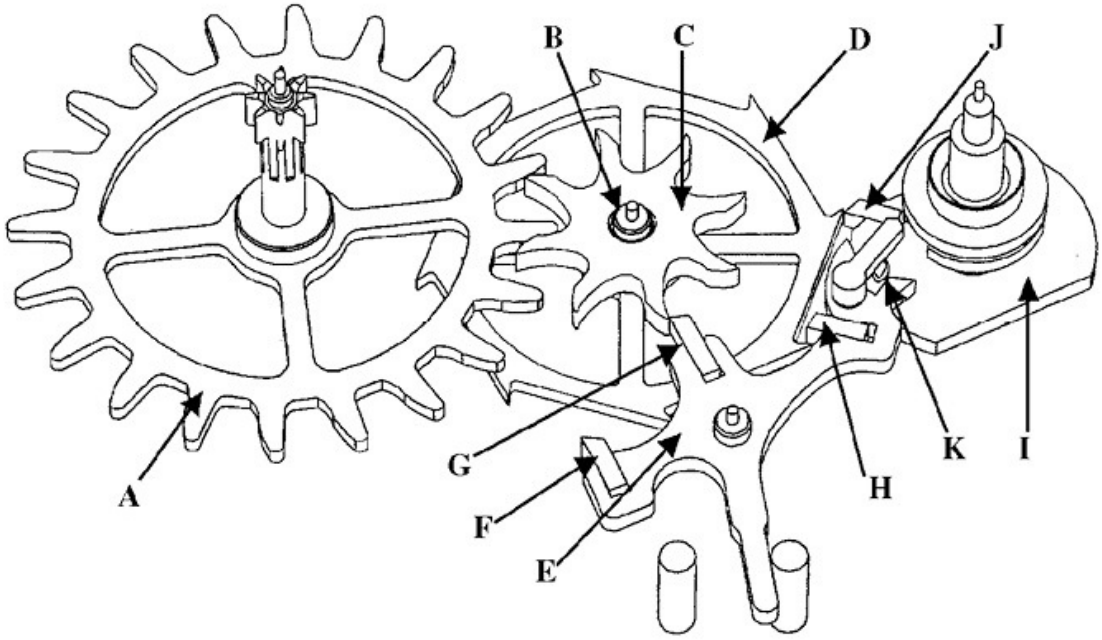


Fig. 5

Diagram and Action of the Escapement

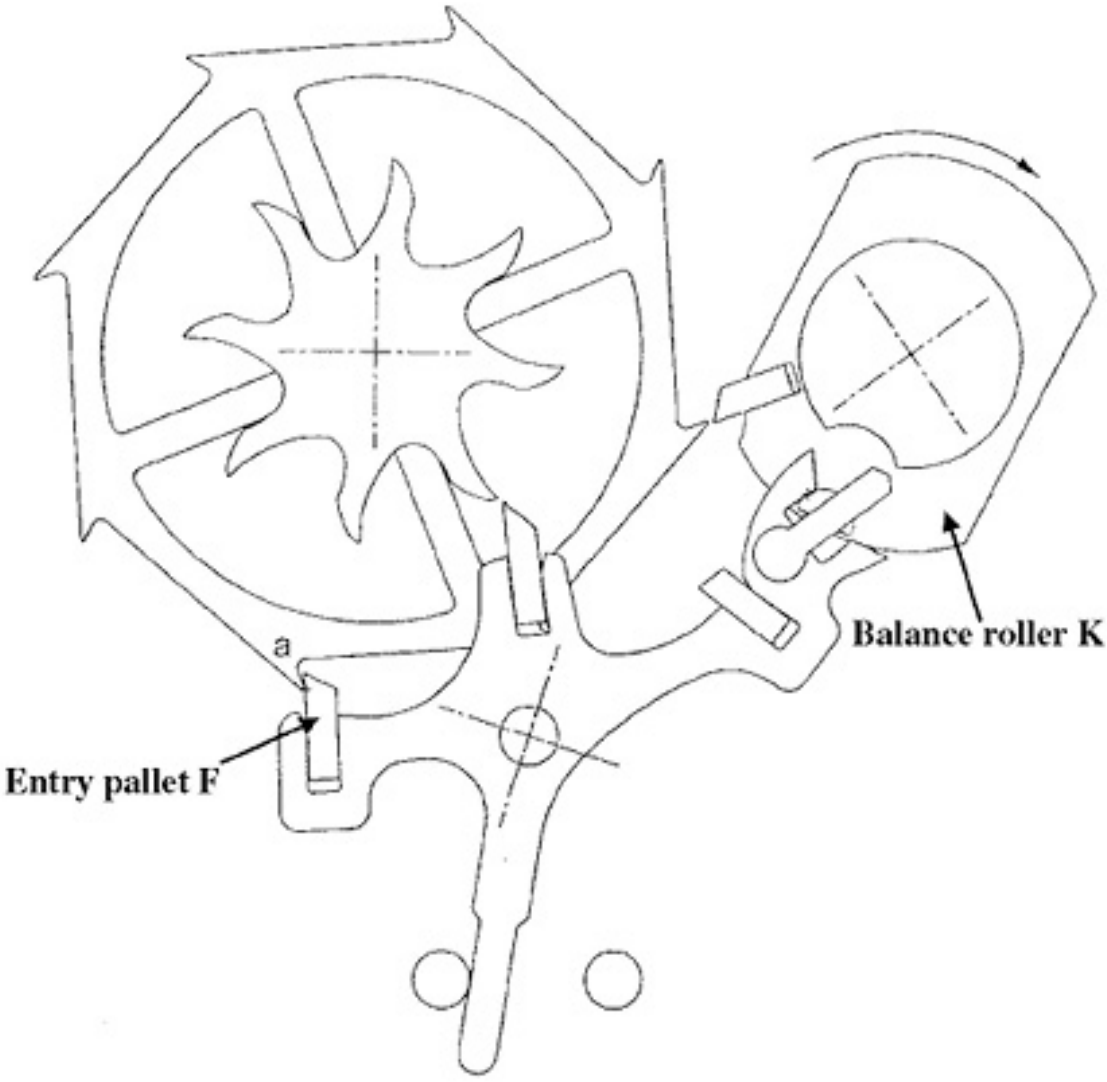


Fig. 5a

The balance roller K turning clockwise to unlock tooth A from entry pallet F

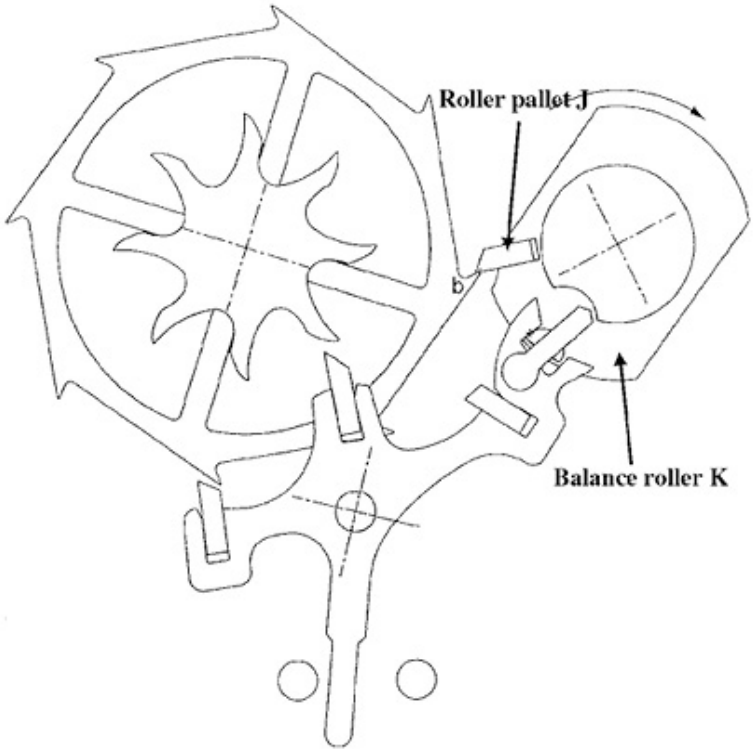


Fig. 5b

Clockwise impulse to balance roller K by tooth B on roller pallet J

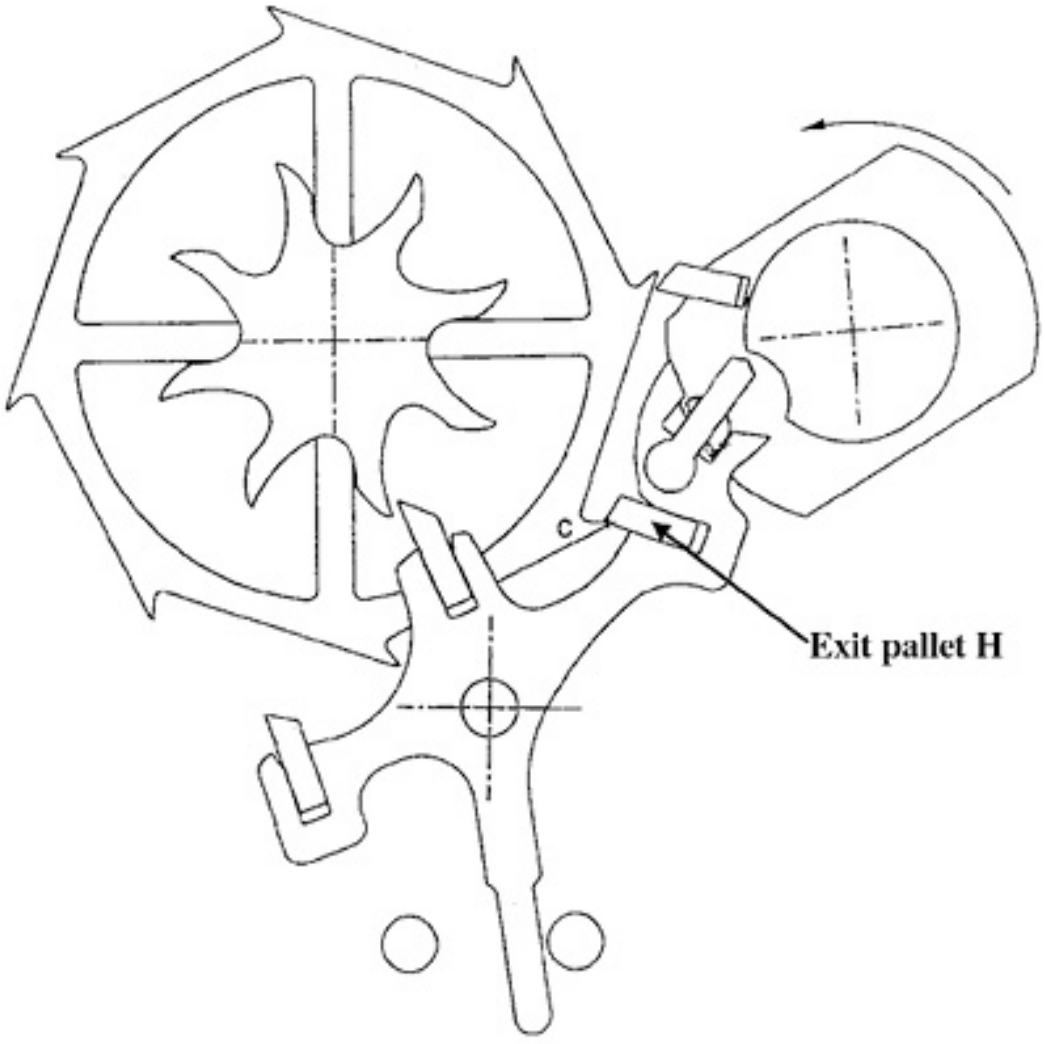


Fig. 5c

The balance turning anti-clockwise to unlock tooth C from exit pallet H

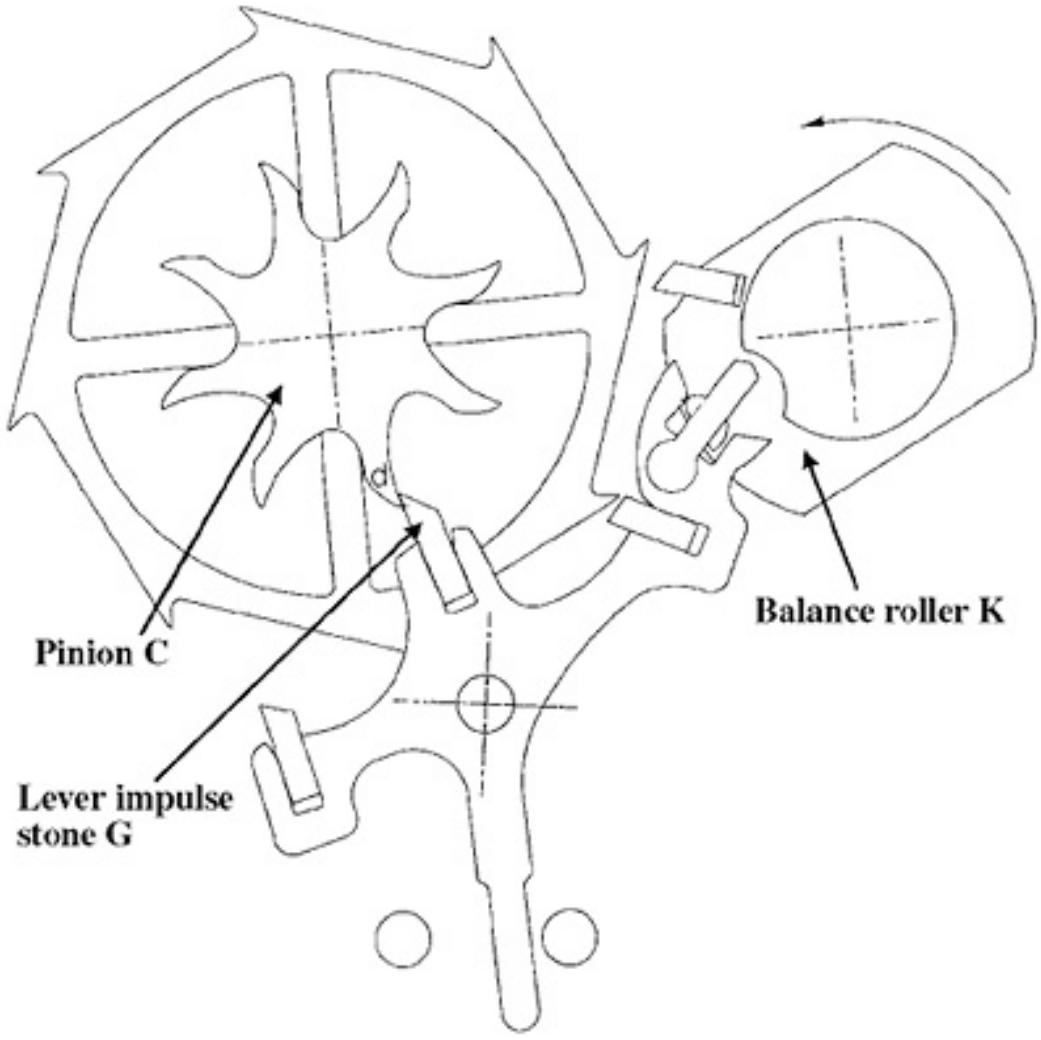


Fig. 5d

Anti-clockwise impulse to balance roller K via tooth D of pinion C and lever-impulse stone G

9

ALFA AND OMEGA

It was my intention in 1996 to retire from all forms of business and spend more time motoring. I was still working at my varied interests but increasingly feeling tired by early evening. I took comfort from regular health checks which showed to my satisfaction that I was as fit as I could be. I would retire, play with my cars and compete in continental motor events.

Alas, the fitness indicated by routine tests was a myth. On my seventieth birthday I had open heart surgery for a double bypass, whatever that may be! It was a failure and had to be repeated later in the year.

This is a distressing thing to go through twice in the space of a few months, and for the first time in my life my spirit was weary. I spent the week following the operation at my London club, then returned to the Isle of Man, where I caught flu. I sought my doctor's advice. She arrived six hours later, but was indifferent to my plight. She did leave a prescription, but as I was not fit enough to present it I never did discover what part of my misery it was meant to help. In any case, my doctor didn't think it necessary to call again to see what effect it may have had.

My spirits were restored by my friends, who rallied round and kept me well nourished, so that after a couple of months I was fully independent again. After twelve months' hard work in the local gymnasium, fitness prevails, my precious motor-racing licence has been restored to me by the RAC, and all thought of retirement has been banished.

In 1997 I bought an Alfa Romeo Le Mans sports car. This had been driven at Le Mans in 1932 by Sir Tim Birkin and Lord Howe, and in the Ards TT by Lord Howe, who won his class at a record speed. I had been half looking for a lighter racing car and had been pleased when this car came up for sale. The heavy Le Mans Bentley was proving to be a bit of a handful on tight corners, and something lighter but with equal performance was needed. With my resuscitated RAC license I decided to divide my time between Alfa and Omega, with a view to the further development of both my social calendar and the watch escapement.

A CHANGE OF DIRECTION

The marketing of the co-axial ended twenty-five years of work on escapements. For the first time in my professional life I had nothing urgent or important to do. More watches was not an option; in the past I had only made a new watch when there was a new idea or innovation to be explored. This meant that the many people who wanted a Daniels watch would not now get one. As the watches take over a year to complete, I could never satisfy the demand.

The last watches made in the workshop were wristwatches. They had created a new demand among practical users rather than connoisseurs and collectors, and it had occurred to me that they could be made in sufficient quantities to supply my eager friends with an individually styled watch with the co-axial escapement. After discussion with Omega it was agreed that they would supply a limited number of *ébauches* to be finished in my workshop in the Daniels style.

I made the first prototype in January. The philosophy behind the watch is, simply, the utmost integrity of construction and finish. Every part is finished by hand methods to produce a flawless finish. The dials, chapter rings and calendar rings are hand-engraved to perfection simply to demonstrate the degree of handwork and finish that was once the standard of the artist–craftsman. The self-winding movement is fitted with an 18-carat gold *guilloché* winding weight

and engraved co-axial escapement. The dials, in common with their predecessors, are signed ‘Daniels London’. The 18-carat cases and buckles are assayed and signed ‘GD’. The cases are engraved with the numerals 99 or 00, which indicates that these watches represent the final development in twentieth-century England of the precision portable timekeeper independent of electricity.

The prototype attracted considerable attention from prospective buyers. It had been my intention to make only a dozen pieces especially to satisfy the demands of friends. But interest has grown so that a limited edition of sixty pieces at the rate of a dozen each year is now possible and accepted by the purchasers.

By comparison with the original thirty watches made in the workshop from 1968 to 1995 the sixty wristwatches will virtually be quantity production and will involve many changes in the workshop’s methods of manufacture. A major encouragement to increased production has been the acquisition of an assistant, Roger Smith from Bolton, Lancashire. To produce watches at the rate of twelve a year without assistance would be too great a task for me on my own, especially considering that the venture started in my seventy-second year.

I first met Roger in my workshop, where he had come to seek my opinion on his first watch, which he had modelled on my book *Watchmaking*. Considering that he was only in his mid twenties it was a very brave effort on his part, and deserving of sincere encouragement. He clearly possessed the dexterity and intuitive understanding that is essential to the creation of a complex watch. I offered some suggestions for possible improvement, and he took them to such good effect that he produced another and much more satisfying example. Knowing his ambition to become an artist in his own right, I agreed that he could come into the workshop for a few years to help with his career. For the first time I am not working alone. The wristwatch venture needs much more diverse attention than the individual watches and there is much repetition of components, so an assistant is very necessary. Without Roger the new watches would be very few in number. When they are

completed I shall be free to pursue other ideas and presumably Roger will want to move on to greater things.

For my part I no longer wish to spend long hours at the bench. This is because my ambitions are fulfilled, and in the past my incentive was always to be experimenting with something new. Einstein suggested that one man in his lifetime could follow only one philosophy. When he has done his best it is for others to continue. I wholly agree, if for no other reason than a dearth of new ideas on my part. I would practice a more relaxing and social philosophy and spend more time motoring, especially in France.

The Isle of Man is some thirty-one miles long by eleven miles wide, so it doesn't take long to exhaust its motoring possibilities. Of course, there is the Manx Motor Racing Club's Autumn Classic event, but this is over within a week. If I was to make longer journeys, and travel the length and breadth of England to see friends without having to cross the Irish sea by ferry, then I needed a pied-à-terre in England. Herefordshire offered easy access from the island, and has beautiful scenery and uncongested roads. To this end, I bought a charming sixteenth-century farmhouse as a stepping-off point for long-distance touring. Built of stone and oak, it was too romantic to pass by, although one never stops working on such houses and I have no great interest in building restoration.

Accommodation for the cars is provided by enormous barns which offer ample room for storage and manoeuvring. Individual garages have been built inside the barns so that the cars have double security and protection from frost. Altogether, the plan is working, and augurs well for future relaxation and access to motoring events. But this does not mean that I shall abandon the workshop. I am working on two new watches, one pocket the other wrist. These will keep me occupied in the winter months. There is now no urgency for their completion for they are not intended to prove anything and there is no longer any deadline to meet. I have actually stopped feeling guilty about not working long and regular hours.

In 1967 I was elected a freeman of the Worshipful Company of Clockmakers. The company was founded by Royal Charter in 1631, and like all such guilds was intended principally to protect the craft from unfair competition. Their central role today is to maintain their individual crafts and, where possible, enhance their trade by education and general encouragement to excel. The freedom is registered at the Lord Chamberlain's Office and may entitle the freeman to become a liveryman if invited by the company. In 1968 Gilbert Edgar was a sheriff of London and master of the Clockmakers' Company. In that year he invited me to take up the livery, which I was pleased to do, and not a little flattered to have been invited so quickly. It was also the year in which I resolved to become a watchmaker and eventually to give up restorations.

During the 1970s I had advanced through the Clockmakers' Company to become a warden and in 1980 I became master. To become a freeman one had to be apprenticed in the City of London, after which one could practice the art of clock and watchmaking in the City. In their prime, the companies were empowered to destroy any bad work reported to them. Nowadays some companies have little connection with their trade. Others, like the Clockmakers, number some 60 per cent associated with the trade, with the remainder representing business, banking, astronomy and so on, and a variety of professional occupations.

In 1981 the then master of the Clockmakers' Company, Jock Moss, set up an Horological Industries Committee. I was appointed chairman and remained so until 1996. During that time we introduced competitions for clockmaking, apprenticeships, and bursaries for colleges and courses. In 1987 a Grand Exhibition of clock and watchmaking took place at Goldsmiths' Hall in London, showing pieces made by British craftsmen. The work meant much travelling backwards and forwards between the Isle of Man and London. It was very rewarding, and our selected pupils have made excellent progress: many of them are now self-employed in horology and some are even taking apprentices of their own.

The task of interviewing and selecting candidates for charitable assistance requires very close, sensitive and experienced

interrogation. It is essential that they are profoundly keen to progress. For this reason I tended to select people who could show intelligent results in practical subjects. Those who did well would receive a certificate showing their progress and would be the more likely to receive assistance in the following years. Most students are quite confident that they will succeed in becoming first-class craftsmen. I should say craftsmen and women, for several young ladies have shown intelligent interest by producing first-class work.

I am often asked why I do not take an apprentice. The simple answer is that I do not have the patience required to give personal instruction. I work very quickly, sometimes advancing two or three moves ahead of the immediate task. It has been a most advantageous factor in my work that I can visualise the whole completed project at the outset, which saves much time in the initial stages of preparing the components. If, for example, a machine is set up to produce the rough components ready for finishing in other parts of the workshop, the same setting and materials can be used for roughing out other different components. An apprentice would not be able to do this, and so his tasks would take much longer.

The only man I ever employed said that the speed of my work was terrifying, and then quit! I am more useful in the role of patron, and to this end I visit schools, talk to the students, show them examples of work and give lectures demonstrating the techniques of developing mechanisms. In addition there are my books.

I am sometimes asked if I have in mind a student who could come into the workshop as an assistant and eventually take over. I would like to think there is one somewhere, but so far we haven’t met. Today’s students don’t seem to have the passion required to succeed. The nine-to-five philosophy seems to be universal. In my experience success requires great application and disregard of the passing hours. A junior doctor is expected to put in some eighty hours work a week during training, but in all other trades forty hours is considered ample. It is not enough if one has ambitions to succeed above all others. I mention these things to students during interviews, and they express their agreement. I have no doubt that

they will succeed in a general way, but will any of them succeed uniquely?

THE ANNUAL LIVERY DINNER

The highlight for the master of a livery company is the annual livery dinner. This is an occasion of much pomp and ceremony. I held mine in the magnificent Goldsmiths' Hall in the City of London. The principal guests were the Lord Mayor and Lady Mayoress Sir Peter and Lady Gadsden, Lord Denning and Lord Robens. It was a splendid and glittering occasion and much enjoyed by all.

During dinner my wife sat next to Lord Denning and showed him a Daniels watch. She carefully explained to him that every part, including the case, was made by me. Denning listened closely. When the Lord Mayor made his speech on behalf of the City he made a reference to a letter from Thomas Tompion, the celebrated English clockmaker, to his casemaker, describing the details of the case he required. When it came to Lord Denning's speech on behalf of the company he put on his best Dorset brogue and began: 'Your master is better than Tompion. He doesn't have to send down the road for a case – he makes his own!' The liverymen were delighted to hear this and applauded long and noisily. It was of course a terrific moment of pride for me and made it the most special of livery dinners. Denning wrote a letter of thanks, and in a PS, said that he wanted to give a farewell present to a colleague, and asked if could I get him a clock at trade price for about £300. Of course I could, and I did.

Every year the fellowship of the livery of the company enjoy the election of sheriffs and the livery service in St Paul's Cathedral, as well as several other social occasions. The election of the sheriff should be announced at twelve noon in Guildhall. On one occasion, there being a dispute about the voting, the platform was still empty at 12.05, as I discovered from my Tompion repeating watch. It occurred to me that others might like to know the time, and so I pressed the pendant to sound the hour of 12.00. The bell rang out loud and clear

through the hall and caused some amusement among the liverymen of the various companies seated nearby. I was soon having to explain repeating watches, and so the time passed pleasantly before the new sheriff finally appeared. There you can see one of the advantages of being a clockmaker! Candlestick makers, fan makers and glass blowers, to name just a few, must sit and wait silently on such occasions.

The Clockmakers' Company's proudest possession is its unique collection of clocks and watches donated by the livery over a 200-year period. It is on public display in the Guildhall Library. Sam Clutton, being a liveryman, had access to the collection, and through him I was allowed to take pieces home to examine and repair. I began this work in 1965, and it was most beneficial in improving both my income and my knowledge. Many pieces were repaired, cleaned and generally restored to working condition to improve the presentation and interest. This period ended with the cleaning of the famous Harrison Chronometer No. 5. This instrument was made by John Harrison, the eventual winner of the £20,000 prize offered by the Government in 1714 for a means of determining the longitude of a ship at sea. It successfully followed the rules of the Act and eventually, with the help of George III, gained the award for Harrison. It was a most enjoyable and rewarding exercise to dismantle, examine and clean the chronometer, so that once again it could be seen working. It was the last practical work I did for the company before I turned to my own manufacture.

A DIFFICULT YEAR

The master of the company occupies the most prominent position in the company, but it is the clerk who, as administrator, occupies the most important position. It needs to be established every year by re-election to office, but as the only continuing officer he is responsible for the day-to-day running of the company.

During my year as master the clerk was Roland Cranstoun Pennefather, who had occupied the office for twenty-five years from

1955 to 1980. Preceding him was his father, William Pennefather, who was clerk from 1918 to 1946, when he was joined by Roland. They served the office jointly until Roley took sole command in 1955. Thus a Pennefather had been clerk to the company for eighty years and it had become almost a tradition. It was seen by the company as a benefit that Roley charged only an honorarium for his services, which he conducted from his own office in Cheapside. He was a most kindly and thoughtful man, of whom I may say I was fond. His manner of administering the company was gently autocratic and many succeeding masters were content to allow this while they enjoyed the court meetings and following hospitality. But from time to time when re-election was due, there were mutterings about looking for someone more lively who could speed up the administration. These usually ceased when it was mentioned that it would be necessary to find more money in order to pay a proper salary to a full-time clerk. I was not prepared to float through my year of office, preferring instead to try and persuade the company to take a greater interest in its trade. I had earlier explained to Roley that there was a revival of interest in mechanical horology and that we should be alert to the possibility of improving the trade by educational means. This was a novel idea to him, and at his advanced age, not something to take too seriously.

I turned up at his office, as he expected of me, to be briefed for my first court meeting. Mr Pennefather, it seems, was busy for the moment, and would see me as soon as may be. For twenty-one minutes I sat waiting, and was then ushered in. He greeted me as if he had been waiting to see me all morning and no one could be more welcome. I knew I had been subjected to a lesson in the proper order of things in the company's affairs and said nothing about my long wait. The twenty-one minutes had not been wasted for I had spent them planning the means of ensuring that Roley would be contentedly retired before my year was finished. I set up a committee to divert attention from my personal interests and conducted all meetings as if it were a great loss to the company. But obviously Roley quite reasonably wanted to retire and we must do all we could to avoid the possibility of his feeling embarrassed at the thought of

depriving us of his near-lifetime service. Twice he changed his mind for sentimental reasons, but in the end I think he was pleased to hand over to a new clerk whom we had already selected. It was not an enjoyable year for me. Although I knew we must have a new clerk, changes are not welcome in old, honourable institutions, and any hint of opposing personalities would have made me very unpopular.

At my livery dinner I made a speech on Roley's behalf which he enjoyed, and presented him with a gold watch on the occasion of his somewhat reluctant retirement. The following year the Horological Industries Committee was founded after discussion with the new master, and I started the company's educational programme which still continues, although after fifteen years I have retired as chairman.

THE COMPANY'S LIVERY LIST FOR 1981

The 350th anniversary of the founding of the Clockmakers' Charter would occur in 1981, and in 1978 a committee was formed to consider ways of commemorating the event. A publications subcommittee was formed, but by the end of 1980 it was plain that there would be no publication. It was of course only a subcommittee, but it smacked of failure and that was not my style. It occurred to me that stored in the clerk's office were the court minute books going back to the founding of the company in 1631. Contained in them would be the names, dates and various offices held by the company liverymen for 350 years. Such a list would be a valuable source of information, of particular use to historians and, perhaps more especially, clock and watch dealers, if not also the liverymen of the company.

A researcher was employed at my expense to produce the list, which took some twelve months to complete. When finished I wrote a foreword to it and had it published with hard covers. Five hundred copies were printed, and I was to recover my costs from sales. I cannot now remember if I did so! Roley's brother Dick, a past master and a hero of the Battle of the River Plate, was unimpressed,

describing it as a telephone directory. But heroic sailors are not noted for their interest in antiquarian matters. As a solicitor Roley, by contrast, loved archives and registers, especially with dates. He wrote me a charming letter about the merits of such a publication and that, probably, we were the only company to possess such a list. Perhaps he was secretly thinking that no one else could have found enough time to waste. The important thing to me was that I had not been associated with a failure, and that the company had the evidence in a useful reference work commemorating its 350th anniversary.

It was during the middle of the 1970s that my voice began to change. For six years I consulted four different specialists, who could either find nothing wrong or who explained that a voice change at my then age of fifty was not unusual. Comforted by these expert opinions I cheerfully sucked lozenges and waited for the symptoms to go away. But they did not, and a new specialist was consulted. Yes, he said, I had an unstable condition which needed radium treatment and perhaps, if necessary, more intensive attention.

This was a particularly bad time for such a complaint, for I had been elected senior warden of the Clockmakers' Company that very year. The following year I was to be elected master and a voice would be needed. Radium treatment was started and lasted six weeks. During the treatment my voice grew weaker and weaker until it almost disappeared. Something dramatic was needed if I was to fulfil my duties as master, and I was quite determined that this peak in my career was not going to be bypassed.

After daily practice under the advice of a speech therapist, my voice recovered sufficiently to be amplified. This was achieved by a tiny pocket transmitter and hidden microphone tuned to a small portable radio, which the Beadle would place in position ready for me to speak. I had no idea how the wardens and court members would take this, but I reasoned that it was either this or give up my position. Moreover, as master I could do as I wished and set a precedent for a formal occasion. Everything went well, and the year ended satisfactorily, my transmitter becoming part of the court room fittings.

The cancer treatment was successful, and with much exercising my voice is usable, and has given expression to many lectures since. Another debilitating illness was left behind thanks to expert treatment, but no thanks to my incompetent specialist medical advisors.

MOVING HOUSE

By 1982, it was time to leave London. I was then in a position to work away from the city and travel in on a monthly basis to attend to my Sotheby's and Clockmakers' Company duties. For the past ten years I had been visiting Sam Clutton, who had retired to the Isle of Man. The island has a most relaxed and congenial atmosphere, with a friendly population of about 70,000 people. My wife and I decided that we could as easily travel to London from the Isle of Man as from any other place in England. It is only a sixty-minute flight and there are three flights a day. The decision was made, and the search for a suitable house started. Within the year we had found and bought Riversdale in the parish of Lezayre.

The house was bought in August, and an architect was retained to see to the restoration of the fabric, which had been much neglected. Everything was to be ready for March of the following year, when we planned to move in. Although much warning was given beforehand, however, when we did arrive we found the house still occupied by carpenters and painters. It was then that we became aware of the islanders' philosophy expressed by the words 'traa dy liooar'. This is difficult to pronounce but simply means 'time enough'. The newcomer should not be deluded by its simplicity, but bear in mind that it is far less urgent than '*mañana*'. We gave up, and moved into a hotel for a month until we could occupy a part of the house. Meanwhile the workmen milled about for a further month completing the work.

Built in 1830 as a holiday haven for a Lancashire mill owner, it is a beautiful, spacious and rather grand house, in which, now divorced, I live alone but without loneliness. As ever my affairs keep

me occupied for some ten to twelve hours a day, and my workshop, which I designed myself, is as magnetic as ever before. Living in the Isle of Man inevitably meant leaving the house in Yorkshire, but it had served our purpose well, and it was time to move on.

There still remained in England my various horological and motoring interests, and these entailed some twelve to eighteen visits each year. It is an unusual and enjoyable exercise to arrive in London in holiday mood, and return to the island still in holiday mood.

Accommodation could have been an expensive business, but as a member of three London clubs, the Athenaeum, the RAC and the Lansdowne, a room is almost always available. On the occasions when all three clubs are full I have friends who, in return for a good dinner, will accommodate me. This is an enjoyable quid pro quo, for I have the pleasure of company to dinner and a snug bed for the night.

London becomes more untenable with each passing year. There seem to be too many cars and not enough taxis. But when on the island I feel a sense of separation from London and its museums, clubs, exhibitions, lectures, antique centres, salerooms and of course its excellent, if ridiculously expensive, restaurants.

SOTHEBY'S

In my pursuit of antiquarian horological knowledge I took to visiting Sotheby's auction house in the early 1960s. At that time, knowledge of antique clocks and watches was of a limited and general nature. From the mid 1960s, with the death of the celebrated dealer Malcolm Gardner, one Philip Coole, who had been Gardner's assistant, took office as Sotheby's consultant, in addition to the post of research assistant at the British Museum. We became close friends, and through his influence I gained privileged admission to the inner sanctums of both Sotheby's and the British Museum. I would visit the Museum on my motorcycle twice a week at 7.30 a.m. Philip and I would have breakfast in a nearby cafe, and then repair to the British

Museum students' room to examine and discuss the watches. Philip's general knowledge of antique watches was excellent as a consequence of his service with Gardner. I had a lot to learn, and so listened carefully to all his comments. His particular interest was the early pre-1600 period, while mine was Breguet and the precision chronometer makers. Only those who have a fascination for the past works of others can understand the excitement of handling their products. For my part, I felt that in analysing their work I was beginning to understand the maker. From this I progressed to analysing the work based upon a mental portrait of the maker's philosophy. I would discuss these ideas with Sam Clutton, much to his enjoyment. Probably they helped him decide that we should share the writing of *Watches*, now accepted as a standard reference work, which, in addition, I also illustrated.

Philip died suddenly in 1969, and as I had been visiting Sotheby's for some ten years and was well known, I was offered the post of consultant horologist. I was pleased to accept, for not only did it enable me to stay close to antique watches, it was also a congenial source of income. Tina Millar, who had been appointed head of the department some years earlier, agreed to my appointment, which continues today. My duties now are not taxing because Tina hardly needs my advice, but we still discuss the more unusual pieces and, especially, the Breguets.

The expertise demanded of consultants is far greater today than it was thirty years ago. In those days the auction rooms were frequented by known dealers with good personal reputations, private collectors, impecunious enthusiasts and students. The catalogues contained only brief descriptions and very few, if any, photographs. Buyers trusted their own judgment and decided for themselves if the item offered was genuine and desirable. Dealers bought with their own money, and put their purchases in stock to await a customer. Each had his own clientele, and the clients had faith in their dealers. Nowadays the buyers are mainly investors, who often do not understand even important objects. They insist on an accurate report from the auction house to ensure that the object is genuine and to establish its condition.

As with pictures and furniture, a new generation of dealers has cast doubt on many objects once accepted as immaculate. These were originally purchased for their historic and aesthetic qualities. Quite often now they are purchased as a hedge against inflation and it is essential that they are exactly as described. The slightest deviation can result in the object being returned under the Consumer Descriptions Act, when it is sometimes impossible to be certain of the truth because opposing experts cannot agree. One would not want to suggest that consulted dealers and experts would deliberately spread confusion, but it is not easy to imagine that the one would want to enhance the reputation of the other. So to commit oneself in a non-commercial atmosphere, for the 'love of the art' one might say, is unlikely. There have been several important cases in the past few years in which most valuable paintings have been described as fakes, and this has also been the case with valuable clocks. It is virtually impossible to decide on one side or the other, and most cases are settled out of court against the person who had most to lose. None of this is good for the cataloguer, who now has an uncomfortable time dealing not only with important fakes that are worth considering, but also with irritating purchasers of unimportant pieces that in bygone days would not have been worth selling. Even the newer dealers, who often attempt to enhance their own perceived prestige by expressing contempt for the views of the cataloguer, abandon their professional pride when, after closer study of their purchase, they find fault with it. If I were a dealer, I would find it too humiliating to return the goods after I had backed my own judgment in purchasing. To my knowledge, this was never done in the past.

I well remember one occasion following the sale of my friend Edward Hornby's collection. One of the most valuable items was a Breguet self-winding pocket watch. It was bought by Edgar Mannheimer, a prominent buyer especially of Breguet watches and clocks. Now deceased, he was a German Jew who still carried his Nazi concentration camp number tattooed on his wrist. He was a congenial swashbuckler with a flexibly good-humoured interpretation of the rules of auction. He could drive a hard bargain but always,

whatever the circumstances of the deal, could justifiably pride himself on his basic honesty. Once, finding myself in Zurich on business, I called at Mannheimer's, merely out of politeness to pass time of day. To my surprise he vigorously attacked me on the subject of the Breguet watch. He claimed it was not genuine, even though it was accompanied by a certificate from Breguet in Paris which described it faithfully. Soon his staff of some half-dozen people gathered around to see my expertise demolished by Mannheimer. He was quite wrong, but nothing I could have said would have changed his mind. But knowing well the pride he took in his position as a singular international dealer I played on his conceit. I explained that the watch was genuine, even though he had been told by a rival dealer that it was not. This does happen sometimes, especially if the rival is piqued because he was out-bid, and Mannheimer's detailed knowledge was abysmal. It was once said of him that he could successfully deal in anything from potatoes to Rolls-Royces without any detailed knowledge of the subject.

I explained to him that we were fortunate to be in the privacy of his own premises so that no outsider could learn that he, the king of the dealers, apparently could not back his own judgment and was accepting the critical views of those who were unable to rise to the occasion when the best was on offer. I repeated, 'You are the king, Edgar, and kings don't make mistakes.' I had never called him Edgar before and he was clearly pleased by this show of compliment and friendship. The matter was closed there and then. As always, he sold the watch for a handsome profit and remained on good terms with the auction rooms. Alas, his death denied other dealers much excitement and speculation, and the rooms are quieter for his absence.

The modern mechanical wristwatch has enjoyed increased sales in the auction rooms in the past twenty years. This is due to the resurgence of interest in the mechanical watch as a reaction against the quartz watch. It was started by me in the late 1960s – I may as well make so bold as to repeat what has been said by others, for I shall certainly receive no credit from the industry. Except in some rare cases, the purchase of used modern wristwatches is

not, in my opinion, likely to be an investment. They are often more expensive than a new example and are in the main too numerous to be of any interest other than adornment. Antique pocket watches are more individual and often have a good technical and intellectual history. They also have an aesthetic quality by way of fine finish and beautiful craftsmanship, which is not to be found in the general run of wristwatches.

In the past few years Anno Domini has directed some of my own watches into the salerooms. The first, which had been sold by me in 1982, fetched three times its sale price. The second, sold in 1973, fetched four times its sale price. The third, which was my first watch, made for Sam Clutton, fetched eighty times the original sale price. The fascination of fine and original watches has assured their value as collectors pieces.

In the boom years, up to about 1980, collections were examined and valued for sale in Zurich, Geneva, Amsterdam, Copenhagen, Paris, Modena, New York, Washington, Seattle, Illinois, Hong Kong, Palm Springs and, of course, several London collections. New York and Paris were my favourites: New York for its bustle, repartee and spectacular buildings. Paris for its beautiful avenues, grand buildings and predictably excellent food. I would, whenever possible, dine at L'Amis Louis in the Rue du Vertbois, close to the Arts et Métier. We chanced upon this rather shabby looking restaurant after a visit to the museum. The tables were arranged in stalls of four on either side of the groove worn in the floor tiles and terminating in a wall covered in fresh fruit. It was a pleasant discovery after the museum, where we had been privileged to remove the historic Le Roy chronometer from its showcase for examination. This had been made possible only after several letters and the presence of George Brown, then proprietor of Breguet. The cover of the machine was removed for close examination, and there being nowhere to rest it, was placed on the floor where Brown, in his excitement, stepped back on it and cracked the glass. As Brown was well known and respected, the matter was hushed away but it was still very embarrassing. After the first bottle of wine it became a part of the day's adventure; after the second bottle it was forgotten!

A DISAGREEABLE EXPERIENCE

While working in Geneva for Sotheby's some twenty years ago, I had my only disagreeable experience in a hotel. Surprisingly, it was a Swiss hotel. On arrival I was given a card inviting me to enjoy a free drink. I took up this offer and at the bar met the very young manager. He was most affable and ordered a drink for me. We chattered away for some minutes in company with his blonde, Swedish barmaid. In return, I offered the manager a drink which he accepted. While waiting for it he excused himself and returned to his office to make a telephone call. The drinks were placed before me and I felt obliged to buy one for the barmaid as well, who had been part of our conversation. She accepted with great pleasure and said she would have champagne. I wasn't best pleased about spending eight francs on champagne when I had received only a very weak whisky, but it would have been churlish to comment. The manager returned, we drank up, and I asked for the bill. To my astonishment it was some 100 Swiss francs. I queried this and was told of the necessity of opening a bottle of champagne for the barmaid's drink. The manager, with an infuriatingly patronising air, described the event as a lesson we all learn at sometime in our lives. Assuming my best man-to-man expression I agreed, and asked him to make out the champagne bill as dinner for two to prevent embarrassment with my expenses. He did so with evident pleasure at his success.

That evening a friend and I enjoyed an excellent dinner with wine at the hotel. When we had finished I left without attracting the attention of the waiter. The next morning I checked out and explained to the cashier that the bill was incorrect because I had already paid for dinner and showed him my receipt. He proposed that we wait for the manager to arrive and settle the matter. That was the last thing I wanted, so I demanded that he call the tourist office or I would leave and settle the bill by post. He gave in and accepted under protest. When I got home I sent the manager a card thanking him for the lesson in life and hoping he had found me equally instructive. I never heard from him again.

When possible, Concorde was my means of travel. This stunningly elegant machine would whisk one across the Atlantic in some three and a half hours. It doesn't always work, however, as I discovered one day when an engine failed half an hour after take-off. We returned to New York, where there was no slot available. After a further twenty minutes stooging about we landed, and within an hour all was ready for departure. Next the brakes were locked on, and the plane would not budge. This took an hour to correct and then the crew announced their tour of duty was over and we would leave the following morning.

To date I have been a consultant at Sotheby's for some thirty years: in the early days, travelling up to Bond Street from Crystal Palace by motorcycle; for the past sixteen years, flying in from the Isle of Man. There have been many changes in those twenty-five years and I do not know many of the present staff, so the old friendly atmosphere is no longer evoked in passing. It has been a most interesting experience, however, and has kept me in touch with antiquarian matters while pursuing my passion for watchmaking. My boss Tina Millar took semi-retirement in 1997, and I followed suit. We meet about once a month at Sotheby's, where there is always something of interest to discuss.

AN AGREEABLE EXPERIENCE

In 1984 I was honoured to receive an invitation to lunch with the Queen and the Duke of Edinburgh. The date was 14 February. I was surprised to discover that there were only eight guests present, as I had supposed it would be a larger gathering. The smaller the gathering, the less likely one is to know someone, but fortunately I recognised John Egan, of Jaguar, from his pictures in motor magazines; Maggie Smith from *The Prime of Miss Jean Brodie*; and the philosopher Bernard Williams, whom I had met briefly in Cambridge when lecturing to the Philosophical Society. Thus comforted, I felt more relaxed and ready to enjoy the occasion.

With the arrival of the Queen, dressed very simply in a blue woollen two-piece, and the Duke, we went to lunch. This was set at a small oval table. The Queen sat opposite the Duke at the centre and we were distributed around the flanks. As always on formal occasions, I wore a three-piece suit with a watch in the waistcoat pocket. During the course of the excellent lunch, the conversation turned to watches. Could I produce one? I did, and it was handed to Bernard Williams. To my astonishment he took it but merely weighed it in his hand and said, ‘I wouldn’t know how to wear a watch like that.’ I was absolutely livid. He was sitting next to the Queen and she couldn’t avoid hearing his remark. I felt that such a vacuous comment needed stamping on and replied carefully, so that neither he nor anyone else could miss a word, ‘Well, sir, if you were a gentleman you would be wearing a waistcoat and have no difficulty in carrying a watch.’ He took it well, and nodded and smiled while the Queen took a sip of wine.

After lunch we moved into a drawing room where the Queen and the Duke stood at opposite corners and we were presented for conversation. I had no experience of what royalty likes to talk about after lunch but I remembered that I had heard somewhere that one always waits to be spoken to. After about three seconds it was plain that the Queen wasn’t going to open the conversation. It was an awkward moment which I squirmed out of by dropping down to run a finger along the back of the royal corgi. It occurred to me, halfway through the manoeuvre, that it might snap my finger off, but it was probably too proud to bite commoners. It remained only to comment that I had told my daughter I would stroke the dog and the conversation was launched.

At the same moment Professor Hilsum, a quartz man from ICI, was presented to the Queen. We bantered between ourselves over which was better, mechanics or quartz. The Queen enjoyed this and laughed in a most uninhibited manner. She has a silvery laugh displaying perfect teeth. (My interest in teeth stems from the loss of some of my own!) Suddenly she pointed a finger at my stomach and demanded, ‘Let me see your watch.’ I was delighted to produce it, and taking it in her hand she said ‘Just one moment’, and turned to

produce her glasses from a handbag. With these in position she examined the watch closely and demanded an explanation of the different information displayed on the dial. She certainly showed an intelligent interest in the watch which, I am bound to say, I had no right to expect. Altogether, for me, it was a unique and most enjoyable occasion.

PATENT APPLICATION

In the early 1970s I had taken out a provisional patent for the independent double wheel escapement. This was simply a device to ensure my priority of invention, and was not proceeded with. It would be too bad if one failed to notify the patent office of an invention, and was then prevented by another patentee from using it.

The patent for the co-axial was a more serious matter and was sought in the European Patent Office. It was the first practical new watch escapement since the introduction of the lever escapement by Thomas Mudge in 1754. It was unlikely that the Patent Office had ever been called upon to consider the originality or otherwise of a watch escapement. A new escapement would need to have the best qualities of the existing lever escapement plus some quality that would produce a better long-term performance.

As discussed, the need for lubrication of the lever escapement is its single weak feature. Knowing its characteristics and failures it might be supposed that they could be easily rectified. In fact, the history of watchmaking is littered with escapement designs calculated to improve both the timekeeping of the watch and its reliability. The essential requirements of the escapement are simple enough. The oscillator must be detached after unlocking the escape wheel and receiving impulse. The impulse must be applied to the oscillator at each vibration of each oscillation. The oscillator must be self-starting from both the run-down condition of the mainspring and the accidentally-stopped condition. Ideally, it would perform all these functions without use of lubricant to the impulse surfaces to ensure constant transfer of force and therefore constant performance.

Apart from these firm basic requirements the dynamic forces are complex and interrelated, so that a careful balance of forces is required to ensure stability and reliability during many years of constant use. The dynamic requirements of the lever escapement are readily understood after two hundred years of use.

There remains only the problem of the lubricant. Breguet declared that given the perfect oil he could make the perfect watch. In spite of the several ingenious escapements he devised he was unable to solve the problem and eventually returned to the lever escapement. The difficulty with the lubricant lies in its natural tendency to age so that the viscosity becomes variable while at the same time it will spread itself over the plate and away from the bearing surfaces. The industry has searched for 150 years for a more stable lubricant and failed to solve the problem although making positive improvements. The ideal solution would be to eliminate the necessity for the lubricant.

There are of course escapements that do not need lubricating. The precision escapements of John Arnold and Thomas Earnshaw do not need oil but impulse only at each alternative vibration and so are unsatisfactory for general use and certainly would not work reliably in a wristwatch. At the other end of the scale, the oldest escapement, the verge, impulses at each vibration and needs no oil. But it is never detached from the oscillator and so the timekeeping is completely at the mercy of variations in the motive force. Thus one must pick one's way carefully through the complex characteristics of existing escapements if one is to devise a new and better one.

Having myself derived a system that fulfilled all the requirements and was not dependant on lubrication I was concerned to see that it was fully protected by patent. Accordingly in 1980 I applied for a provisional patent. As expected, the patent office produced three earlier patent applications for escapements claiming to pre-empt my application. I replied that since all three had been granted patents they must each be different. Which one was the same as mine? They declined to choose and insisted that I show why mine was different. Clearly, they didn't know anything about watch escapements and weren't going to admit as much. The

correspondence went on between my patent lawyer and myself, and between him and the patent office, for two years. I was not going to give in. I sought support from noted international horologists who wrote giving their opinion that the mechanism was original and that because of its original arrangement of the components it could avoid unwanted actions of other escapements, especially those proffered by the patent office. The cited escapements were the single-lift Robin, which gives impulse only at alternate vibrations, the double-lift Robin by Breguet which needs oil, and the Fasholt, which is a single-lift escapement. I explained their shortcomings – they refused to accept them. I pointed out that my arrangement of the known principles of mechanics was manifestly different to all others, as verified by several well-established experts. They couldn't see it. I quoted a patent granted to the Triumph motor company for a new valve gear which contained a camshaft, rocker, valve and valve spring just as every other engine does but, because it was a different arrangement a patent was granted. They were unimpressed. Finally, we re-wrote the citation to include the words: 'the locking and impulse pallets have entirely separate functions'. They were magic words, for they had not been used in any other of the applications and were therefore new and original. In addition, I wrote a letter to the patent office pointing out that if I were fool enough to waste my money on a worthless patent it would be only my loss if it were pirated and I had no redress. The patent was granted and back-dated to 1980.

I imagine some self-important, minor civil servant whose only qualifications are a second-class engineering degree and his own conceit. For two years he caused me anxiety and considerable expense. His ignorance of the subject cost him nothing.

10

WHEELS

Although horology has been a dominant factor throughout my life, I have nevertheless found much pleasure and relaxation in restoring, rebuilding and competing vintage and veteran motor cars. The laws of physics for watches are much the same for motor cars. The principal difference might be said to be mainly in the size of hammer used for the work in hand.

In 1947 I could not afford a car. Newly demobbed I went everywhere by bicycle or bus. It was a slow business, although the charms of bicycling are not to be denied. Two years later, in the interests of quicker travel, I bought a motorbike and finally a motor car. This led to my first Bentley – the make to which I show most allegiance.

Used for social, domestic and pleasure pursuits, the modern motor car is the most brilliant development of a primitive conception. Everyone has, in effect, his own coach and horses always available. But many have become dull, with all the character ironed out in the interests of pleasing motoring journalists, who set one make against another in their columns by petty criticisms more directed to showing off their own knowledge than to improving the motor car. As a consequence, modern cars are boringly similar and best used only for long runs, where their undoubted comfort is beneficial in today's heavy traffic. Vintage cars can be much more fun than modern cars which, because of traffic conditions, can now only travel at the same speed as vintage cars anyway. It is said that old cars are unreliable

and uncomfortable, especially in inclement weather, but the enthusiast is oblivious to any such discomfort.

I bought my first car in the 1950s, when it was already twenty-three years old. Many more have come and gone in the interim, including thirteen Bentleys of one sort or another from the earliest to the latest models. But some cars are special for historic or romantic reasons and these I keep and use as their makers intended, and for the pleasure of their individual charm.

As a child, cars were all around me, for we lived in a flat above a shop in a main street – the streets were our playground and we learnt how to dodge the traffic. Once, when I was four years old, I wasn't quick enough and collided with a lorry. I can remember clearly the driver looking down at me as I ran in vain to escape and I also remember a stout man, as I lay in the road surrounded by onlookers, shouting 'Give him air, give him air!' As I was breathing normally I couldn't understand what the fuss was about. The event ended with some weeks in Redhill General Hospital. I seem to have escaped without serious injury, although I carry the scars to this day. Unfortunately, I didn't get a ride in an ambulance because the hospital was so close that it was quicker to carry me!

Otherwise, my contact with motor cars was minimal. Our moonlight flits from house to house were conducted by horse and cart, so no motor car or van ride for us. With the move to the house at Kenton we saw fewer cars as we were in the midst of a large housing estate where no one owned a motor car. My friend Peter's father had a three-wheel Morgan which Peter, at about ten years of age, was allowed to drive within the confines of the estate – strictly illegal, but no policeman was ever seen and one was never needed. The milk was delivered by horse and all other deliveries were made on foot by men pushing vans. To get to Kenton to practice my newly developed firewood interests, I would walk. On the way, I passed a solicitor's office. Parked outside was his Bentley saloon, a beautiful blue and black creation with polished-wood interior fittings and brown-leather seats. To my untutored eye it stood out as a machine of beautiful lines and top quality. It was a machine to desire, but it would be a further twenty years before I would own one.

In the army I was given instruction in driving a tracked vehicle. In cold weather this was uncomfortable and tiring, even at the age of nineteen. In 1947, after army service, I bought a bicycle because I liked cycling and it cost almost nothing to run. Any spare money was spent on watchmaking tools. Two years later the bicycle was exchanged for a second-hand motorcycle on the persuasion of my cycling friend, Peter, who professed to understand them. He wasn't a very good mechanic, however, and in 1950 I part-exchanged it for a new one. This was a Sunbeam, chosen because it looked as if it had been designed as a whole. Most British bikes at that time were assembled from disjointed components and looked fragile which, often, they were. Of my acquaintances who knew about motorcycles, no one had anything good to say about my choice. They rode macho machines such as Norton, Vincent HRD, BSA and Matchless. Such machines had a speed and verve that the Sunbeam was not designed for, but speed was of little interest to me and I preferred the unique design and simple elegance of the Sunbeam. And for all their speed, my friends didn't travel far. Their motorcycling was confined to visiting local friends and cafes. My so-called inferior machine was put to more vigorous use and journeyed as far west as Penzance, as far north as Inverness, and to most places in between. With so little traffic on the roads it was a wonderful time to tour on a motorcycle, and I took full advantage of the conditions.

At that time I was living in digs in Croydon. I soon regretted this and moved back to May and Jack in Edgware. I hadn't realised how well off I was with them. My temporary landlady would watch closely to see that I didn't overstep my bounds. I was given strict instructions on how to conduct myself in the house – what time to use the bathroom, which towels to use, strict hours for meals and no seconds of anything. Every day, pudding was a lemon tart floating in a sea of thin rice. I did once have the temerity to mention how nice a change would be, but to no effect. I could stay or leave as I pleased. At twenty-four one is not very sensitive of other people's prejudices, and it was therefore with total innocence that I stripped the wheel out of my motor cycle on the pavement outside the house to repair a puncture. She was furious at the thought of what the neighbours

would think of a lout with a motorbike thus desecrating her property, and I had to go.

It was generally accepted that motorbikes were used by the lower orders. This was brought home to me by the mother of my first girlfriend, who would frown and sniff pointedly whenever I arrived at the house. I found this very irritating, so my girlfriend and I took to meeting at a nearby street corner. The solution was to get a motor car. I fancied an MG, which to me represented a step up from a bike. Looking one day in a shop window, I fell into conversation with an MG owner whose car, a model J2, stood at the curb. It transpired that he would sell it for £295. It gleamed with chrome fittings and British racing green paint and looked very desirable. I resolved to have it, and made note of his address in Wembley, which was some five or six miles away from my digs with May and Jack. I sold my motorbike for £200 (it had cost £260 a year earlier) and bought the car.

Because I hadn't got a licence to drive a car and had almost no experience of driving, I sought the vendor's advice. He explained how to engage gear and set all in motion, and I moved off on the drive home. Getting from bottom gear to second and higher was a problem, but I managed it and eventually engaged top gear. Occasionally I needed to slow down and this needed a lower gear. I could not find one! Eventually I made the whole journey in top gear with the result that the sorely tried crankshaft broke just a few yards from home. Having no other transport, I was obliged to journey to Croydon every day on the underground and Southern Railways until the car was fixed. But who would do it? I had no money for expensive repairs and had no experience of the internal combustion engine. There was nothing for it but to start gaining personal experience of motor engines.

With a newly purchased, reconditioned crankshaft and connecting rods, I made a start by pulling the engine to pieces at the weekend. It looked surprisingly simple inside and offered no resistance to the foreign components. The following weekend was spent getting the engine back in the chassis. By 1 a.m. on Monday I was ready to fit the gearbox to the engine. It would have been better

to do this before putting the engine back, but I was not strong enough to lift the two together and had no assistance. By then I was very tired (I had been in the garage since 6 a.m. on Sunday), and I have only a hazy recollection of crouching under the dashboard with the gearbox held forwards at arm's length, trying to guide the clutch spigot into its splines. I was surprised when it suddenly gave up and fell in without further resistance. All weariness fell away! I was almost finished and worked on until morning to complete the work. At 5 a.m. it was back to the digs to clean up and catch the 6 a.m. train to Croydon, where I had a full day's work to do. So great was my elation that I felt no weariness. I was particularly pleased that in two weekends, albeit very long ones, I had managed to remove, repair and re-fit the engine all by myself.

The next important task was to get through the driving test. I practised with a friend who drove regularly but who also, I afterwards discovered, had no driving licence! The test was taken at Hendon. My tester was a diminutive, grey-haired, sharp little man with a slightly officious manner. I was in no doubt about my driving ability and confidently put on a brilliant display of showmanship skills at the wheel. When all was over, he told me I was one of the worst drivers he had ever met: I took the corners too fast, showed insufficient care at junctions, exceeded the speed limit and failed to give adequate signals. I must say I was surprised to hear this criticism. The roads were empty and I had supposed he would be pleased to find a learner who could show some individuality under favourable conditions. There is no accounting for the individual whims and fancies of driving examiners. The next time I drove carefully and considerately, like everyone else, and passed the test.

The car was very small but great fun to drive, and more comfortable than a motorbike in the rain. It had a maximum speed of about 60 mph, at which pace it needed some concentration to prevent it from using both sides of the road. Feeling that the MG was a bit of a toy and that there was nothing further to learn from it, I traded it for a Rover 16. Rovers were good quality and well engineered; it would offer more interest than the MG. As with the MG, it was used for holidays in the summer and public holidays, but

for the most part it was for playing with. Every time a component was overhauled the car was improved and a little nearer new specification. This, combined with the increasing pleasure I got from driving as I became more competent, made the ownership of a car more enjoyable.

Of course, the Rover needed rebuilding throughout, and even if it hadn't I would have probably taken it to pieces anyway. It was a rather grand car and could seat five in comfort. This was useful for attending motor-race meetings with friends, where in the early 1950s there was none of the razzmatazz and pretension that attends today's Grand Prix meetings. One simply turned up, parked the car, paid for entry and settled down to cooking breakfast alongside the circuit. The drivers were ordinary looking men who didn't hide in motor homes or behind PR teams. One could talk to them in the paddock and they were knowledgeable enough to understand their cars and talk about them. All the great names belonging to a special breed of driver who raced for the pleasure of the sport could be found in the paddock, with their cars. Nowadays, race circuits are like prison camps with fenced-off enclosures. To move from one to the other one must pay extra. Observation is confined to paying enclosures on the outside of the circuits. No contact with car or driver is allowed, for the cars are hidden in the pits and the drivers are too important to mix with their fans – altogether a rather pretentious business.

Once the Rover was overhauled it was too boring to keep, so I exchanged it for another modern MG. This needed no attention and so was extremely boring, although great fun when driven. I had a friend who was a mechanic at the Kieft Racing Stable. They used very highly tuned MG engines. After each race, modifications would be made to the engines to attain even greater speed. The discarded parts would find their way onto my engine, so I had a very fast car that was capable of 100 mph. Then, feeling a need for another change, I bought another Rover, this time a post-war model. It was smooth and quiet and very dignified. I soon grew tired of it and sold it to a friend. My heart lay elsewhere and my first love – the Bentleys – were about to make an appearance in my life.

THE W.O. BENTLEYS FROM CRICKLEWOOD

From 1922 to 1932, Bentley Motors produced four models. Two of these, the Speed 6.5 litre and the 8 litre, were six-cylinder models. My preference was for the four-cylinder models, especially the 4.5-litre car. EL 1112 is an excellent example of the later 4.5 litre with standard Van den Plas coachwork, including the long wings and bonnet, two nearside doors, two spare wheels, a plate clutch and self-wrapping brakes. This car, one of my recent purchases, replaced the short-chassis replica blower that I built during the 1990s. I later regretted the time and labour I spent on this car. It was very difficult to 'unpark' in town, and I discovered that short-chassis cars, like Phantom II Rolls-Royces, tend to wander about when driven at speed on narrow rutted roads – hence my search for a standard car.

After two years of looking and making enquiries, however, I came to the conclusion that the car I now wanted to buy was a rare object and, perhaps, a threatened species. The reason for this was that all too many of them had found their way into the cosmetic department of Birkin coach-builders for a face-lift and a big fuel tank. I was lucky in the end, though. Tim Houlding, who specialises in such discoveries, came up with a car that had a curious history and followed the exact specification I had asked for.

Its first owner in 1929 was the Maharajah of Blevanagar, who covered some 21,000 miles in it before his family sold it in 1964 to Mr A. Sparrow, who had worked for the Maharajah. Mr Sparrow then exported it to England where it was lodged in the Cheddar Motor Museum. When this closed in 1979, the car, with 30,000 miles on the clock was bought by Mr L. Thomas. To its credit, it now has 41,000 miles on its clock. In 1982 I intended to fit new pistons and rings but, as the bores were in such excellent condition, only the rings were changed.

I was very pleased with my purchase and today, after forty years of driving modified, highly-tuned Bentleys, I am once again discovering the charms of Bentley's formula for a standard road-

going 4.5-litre car. On the road, this car admirably demonstrates the merit of Bentley's conception, and adds force to his opinion that supercharging the Bentley brings no merit and, indeed, corrupts the original conception of the 4.5-litre car. Certainly a Blower will out-perform a standard car in a straight line, but changing direction at speed is likely to induce severe understeer causing the car to go straight on with full lock applied. I first experienced this at Le Mans during a Bentley rally. Following two 'un-blown' cars at speed into the corner, I discovered to my consternation – and that of my passenger – that we were out of control. Fortunately there was an ample run-off area so no damage was done.

In his book *Full Throttle*, Tim Birkin, who conceived the Blower cars, describes an incident at Ballystockart Bridge when he found himself too close to the kerb. As he hurriedly tweaked the steering wheel, this caused the front wheels to unstick and he crashed the car. 'Hurriedly turning the steering wheel,' he explained, 'is the worst thing one can do in a racing car.' Well, yes. Especially if, like Birkin, the car is on the limit of adhesion! This problem is much improved with fat racing tyres and smaller wheels, but these do not look elegant and are often not permitted in competition circles.

After the cumbersome weight of the 4.5-litre Blower, the standard 4.5 litre is much lighter to handle, especially when parking in the average high street. To get a Bentley out of a confined parking space requires considerable strength to turn the steering wheel and it is made even more difficult by the addition of the blower. With softer road springs the ride is comfortable and smooth, and with the correct 525-21 tyres the steering is lighter and easier at town speeds. On country roads the long chassis ensures good straight-line running with none of the wander experienced in a short-chassis car.

I have earlier mentioned the manner in which I purchased my first Bentley. With this car I felt completely at home. Its expensive, shabby and worn interior spoke of kinder, more elegant days: the design, the attention to detail, the integrity of its construction, and the standard of engineering all showed a disregard for economy. It was a gentleman's carriage built to a standard that only the wealthy could

afford. In addition, being of 1924 manufacture, it had a certain nostalgia for me, being one of the motor cars I had noted being driven around in the 1930s. I bought the car in 1956, much to the amusement of my friends who owned more sporting Bentleys. It was heavily used at weekends and was frequently in pieces for renovation. The work was done piecemeal in order to get the maximum use of the car. It could often be seen in Covent Garden where, in those far-off days, one could park in the market and go to the opera. Over the next four years, as earlier described, it was completely rebuilt to original condition, after which I lost interest and sold it.

Not all of my Bentleys were rebuilt. Some were bought simply because they were there and couldn't be resisted. Often they were bought because they were too cheap not to buy. The lowest price paid was £75 for a fabric-saloon 4.5 litre. Two or three were bought for under £100. They were perfectly good cars which the owners had bought probably to fulfil a boyhood longing and, finding them relatively difficult to manage, had then neglected them. I took it upon myself to save them from the breaker's yard. Once the tyres were inflated and the body work tidied up, there was always a customer willing to take them on. The money raised was not great but it enabled me to rebuild and run other cars without capital expenditure.

I remain a Bentley enthusiast and still own four examples. To me they represent the best in motoring. They have speed, reliability and room for people and luggage. A seventy-year-old 4.5 litre will cruise effortlessly at 80 mph for thousands of miles, without any attention other than routine servicing.

1909 JACKSON

My 1909 Jackson with single-cylinder De Dion engine was bought in 1959. It is light and simple in construction, with looks that appealed to me even though it was a poser's car with a tiny engine occupying a long, sporty bonnet. I entered it for the Boxing Day Exeter Run in about 1959, starting at 8 p.m. at Kingston. The weather was dry but

very cold and windy. My friend Cliff Robinson reluctantly accompanied me. We were both dressed in enormous, ex-army dispatch-riders' topcoats, and took with us a bottle of brandy (quite legal in those days) and a carrier bag full of goose-dripping sandwiches.

So strong was the headwind that by midnight we had covered only sixty miles. This in low gear because the car had insufficient power to cope with the conditions in higher gear. The intense vibration of the engine had caused the brackets of both gas headlamps to break off so that we were left with oil side lamps only. By then all of the sandwiches and most of the brandy had gone. Then down came the rain, driving so hard that it was impossible to drive into it. We were forced to abandon the trip and turn round. With the wind now behind us the car was ready to travel at any speed but the brakes were very poor so that we were continuously in danger of leaving the road, this because it was pitch dark and we had by then only one sidelight. It was a very exciting journey and we were relieved to get back to the Kingston bypass.

At Croydon, the last sidelight and finally the single tail-light failed. We were eventually rescued by a kindly police car which conducted us back home by 3 a.m. It had taken seven hours to cover 120 miles and we failed to make it to Exeter, but the car was great fun and carried me on several successful foreign journeys without mishap.

MOTOR SPORT

My success in competitive events has been limited by my refusal to modify the cars simply for speed, which requires not only making many modifications of the engine, but also cutting all possible weight from the car to lighten it. Eventually, the car will look nothing like the original and becomes extremely unsuitable for road use. My view is that if one wants to race to win, one should do it in a racing car, and leave the vintage and historic cars to those who will appreciate them for what they are. Since only one car can win, and experience shows

that some drivers will go to any lengths to keep winning, it surely must be futile to overdevelop the rest of the field. In any case, I have never done it, and so my record of victories is small. After forty years of attendance I still have great fun driving my car flat out on a race circuit, and occasionally gaining an award unexpectedly surprises me. Most importantly, the cars still look like the Bentleys that Walter Owen Bentley designed in the 1920s and which gained for him a unique reputation on the race tracks and at Le Mans.

If one takes racing seriously it can be an all-consuming passion that can devour all one's time and money. My own participation can hardly be described as serious, but nevertheless it often makes demands beyond those required for other sports. The car must be meticulously prepared for both safety and reliability. Close examination by RAC scrutineers will reveal any safety faults which, if not rectified at once, can lead to disqualification from the event. The majority of drivers, like me, prepare their own cars. Pressures of business usually mean that preparation work is not done until the event is imminent. We can all can recount stories of burning the midnight oil to finish the car, followed by a drive to reach the circuit in time for signing on.

To attend Silverstone in Buckinghamshire from south London means a 5 a.m. start after working until the early hours to get the car ready. The run to the circuit is the only testing the car gets, and final adjustments are made on arrival. It might be thought that a little planning in advance would enable one to complete the car in plenty of time, and so get a good night's sleep before leaving home. In later years this was possible, but in the earlier days, around 1960, when I was working very hard for long hours in order to establish my business, I could never get into the garage before Friday evening to prepare the car for Saturday racing, and there was no money available to employ a mechanic. For some timed events I used the Triumph TR3A or Jaguar E Type. These are not suitable for racing in standard tune, but can cope well with sprints and hill climbs. For racing events the Bentley was favoured, although it was far too heavy to be quick on a twisty course and I never won a scratch race. Occasionally, I would achieve a win in a handicap, but in forty years I

gained less than a dozen awards. I was never tempted to change the character of the car in order to improve its chances. Winning just wasn't important where motor cars were concerned. I was the veriest amateur who turned up simply for the enjoyment of driving my car as fast as possible under ideal conditions.

The circuits I favour for racing are Silverstone, Oulton Park and Donington Park. There are several other venues and some competitors are keen enough to attend all of them each year. The two most popular hill climbs are Prescott and Shelsley Walsh. Neither of the Bentleys, UU 5871 or MN 3740, are suited to hill-climbing or small circuits, for they are variously heavy, high-geared and long. The Alfa Romeo, being shorter and lighter, is better suited for both hill climbing and racing. Hill-climbing is a most relaxing and enjoyable event. Two practice runs are followed by two competitive, timed runs and, for the remainder of the day the competitors eat, drink and talk mainly about cars. No alcohol is allowed until one's runs are completed! Such events are social occasions, without partisanship on the part of the spectators, whose main purpose is to see their favourite car in action. A certain group rivalry exists between owners of cars in differing classes, but unlike modern racing the rivalry is not obsessive and not usually between drivers. It is more between different makes of cars – each driver is anxious to demonstrate the worthiness of his chosen make. Most drivers are motivated by fun and sportsmanship and are very willing to give a helping hand to a competitor in difficulties.

In the Isle of Man, racing is a traditional part of life. There have been timed trials for motor cars since the Gordon Bennet trials in 1904 and for motorcyclists since 1907, which take place on closed public roads. In the summer months the motorcycle TT is held, usually at the beginning of June. The island is then the venue for thousands of motorcyclists and their passengers. In the past, in other places, motorcyclists have caused problems through rowdyism, but never on the Isle of Man. Here the visitors come to watch the racing and to test their bikes at speed on the open, de-restricted mountain roads. Every year this results in some tragedy for the riders and the immediate cry is to close down the event, but the majority of

accidents involve visitors, not competitors, and young men are always at risk if they are looking to test themselves. In the autumn, there is the Manx Grand Prix, which must be completed to qualify for the TT. The competitors are mainly young riders needing practice to gain experience of the tricky, thirty-mile-plus course, with its hundreds of high-speed bends. Only the most skilful and determined riders can win the races on the mountain course. Although these events are now considered to be unsuitable for international calendar events, riders of all classes of motorcycle racing know that the mountain course is the ultimate challenge of nerve and skill.

In the autumn the Manx Motor Racing Club holds its annual sprint and speed meeting on the Willaston section of the mountain course, and a race meeting at Jurby, in addition to a hill climb. These are well-attended events and offer, on public roads, an experience that no club circuit can equal. To race on roads lined with the paraphernalia of modern society gives a true impression of the speeds the cars can reach and of course stretches the driver's ability.

SUPERCHARGED 4.5 LITRE BENTLEY YU 3250

Generally speaking my racing was a casual affair, but there were times when sterner methods were demanded. One such was the 1988 Mercedes vs Bentley event at the Nurburgring. The commemoration of Birkin's participation in a race at the circuit in 1926 was the occasion for the event. There were to be twelve Mercedes and twelve Bentleys racing, with a cup for the fastest lap. It was a very relaxed meeting, but I was driving the long chassis Birkin team car, YU 3250, and felt responsible for the honour of the Bentley team, although this was never mentioned and there was no pressure put upon me. I knew a Mercedes must not beat me, even though they were 7 litres supercharged against the Bentley's 4.5 litres supercharged. The start, en masse, was very relaxed and the individual cars accelerated up to the speed chosen to ensure regularity, which was the declared aim of the event. I chose to go flat

out throughout the twelve laps, which, provided my car was fast enough, seemed to me to be the simplest way to achieve regularity and at the same time ensure that I had the fastest lap. The simple plan was to press the accelerator foot to the floorboards and hold it there for as long as possible around each lap. I had no idea where I was in the event or how many cars were in front of me when we started. It turned out at the drop of the chequered flag that I had lapped everyone once and some twice! So the trophy came to the Bentley team and Birkin's defeat in 1926 was avenged. Such was my race preparation that I discovered upon arrival in the paddock that I had been carrying a 14 kg weight penalty in the form of a kit of tools and a spare drive shaft, which I had forgotten to remove from the car before the event.

The car, known universally by its number plate YU 3250, was bought in the early 1980s from Anne Shoesmith, whose father, Harry Rose, had bought it in the 1950s and restored it to sound running condition. It was Sir Tim Birkin's first experimental supercharged car, and his team became known as the Bentley Blowers on account of their superchargers, which blew increased air and petrol mixture into the engine to produce more power. Anne herself is a first-class Bentley driver with a distinguished competition record. I think the car, which weighs two tons, was too heavy for her, and it was very expensive to run, to say nothing of being in need of a further expensive overhaul. This was reflected in the constant oiling of the plugs and clouds of grey smoke from the exhaust. In collecting it I made arrangements to stay a weekend with Ronald Barker, the ever-popular motoring correspondent. I collected the car on the Saturday morning and drove to his house in Shorncote near Cirencester. It ran roughly and needed frequent revving to clear the cylinders of oil. In the lower gears it ran better and, with its high-gear overall ratio, it could be driven quite fast without over-revving. After some miles I got the hang of it and found it to be smooth and fast and, kept above 2,000 rpm, the oiling problem was held at bay. Sunday was spent adjusting the fuel and ignition, cleaning the plugs and generally preparing the car for the run north up to Heysham. I had a small bag of tools which I had borrowed from Anne in the car (one never goes

anywhere with an old car or motorbike without a bag of tools, a roll of sticky tape and length or two of wire) but for convenience used Barker's workshop and tools for the preparatory work.

The boat from Heysham to Douglas leaves at 2.30 p.m. and so I was up and about in darkness at 6 a.m. for the journey on Monday. That day Barker was going to Italy and left the house before me in order to get to London Airport. He left me to lock up and put the keys through the letterbox (after I had fed the five cats who would then be looked after by neighbours). It was dark and raining hard. The car was in a shed some thirty-two squelching, muddy metres away. It started after several slow, anxious turns of the 75-mm main bearings in stone-cold fifty-grade oil. I began to reverse out of the shed, my shoes by now covered in mud. My left foot slipped off the polished steel surface of the clutch pedal and the rear wheel spun itself into the mud and I was stuck. Bad weather conditions during an early start in an open car without a heater do not usually depress old-hand drivers. They are, for the most part, optimists who will gain great pleasure from the anticipated drive and the meeting at journey's end with fellow enthusiasts. Most people wouldn't believe there could be any fun in it at all, and even I had to confess to myself at that moment that the situation was a little depressing. By now I was very wet and sitting in a pool of water on the seat, and this may have influenced my feelings.

Scrabbling about in near darkness I found stones and bits of wood to put under the guilty wheel. The car rolled out after the third attempt and kept moving until it was safely on the hard standing. It only remained to lock the shed and house and put the keys through the letterbox. As soon as I had done this the engine went onto two cylinders – the plugs had oiled. I had no spare plugs. It was now raining really hard and any attempt to remove and wash the plugs in the petrol tank would have exposed the magnetos to the downpour with inevitable ignition failure. I put my hat over the magneto and rummaged into the tool bag for a spanner. With the bag held up to the headlights it was plain there was no plug spanner in the bag. Barker's tools I had locked in the shed. The keys were on the house

doormat with the cats. There was nothing for it but to make the best way I could on two cylinders.

After a half hour of wandering about in the dark in a maze of lanes without signposts, I stumbled upon the A419 to Cirencester where I hoped to find a garage. Only one was open at 7 a.m. and it didn't have a workshop, and therefore no spanner. At 40 mph in second gear I headed for the motorway. Suddenly a third cylinder chimed in and the car leapt forward eagerly in its new-found vigour. Without seeing another open garage I reached the M5 and decided to press on with three cylinders. This was my first cruising experience in a 'Blower' and I was pleasantly surprised by the easy way it ran even on three cylinders. Indeed, it ran so easily that after a few exploratory miles it was doing 80 mph without effort.

At the first available service station I enquired after a spanner but nothing was available. Several such stops were made but no plugs or spanners were to be found. But the car was going so well I decided simply to press on and attempt a plug change at Heysham. Thus resolved I set off, feeling less anxious about the running and confident that the car would complete the journey. Soon after Tewkesbury I was obliged to lift off the throttle to fit into the traffic pattern. The engine failed to respond to reopening the throttle and I was forced to dive through the traffic to stop on the hard shoulder. The engine continued to tick over but would not respond to the throttle. I spent half an hour going through the relevant bits to find the fault but everything seemed in order. My optimism in completing the journey was under pressure. The rain, driven by a strong north easterly wind, was becoming painful. A further fifteen minutes was spent trying to raise the hood for protection. However, even straining with all my strength I was unable to persuade the shrunken canvas to reach the windscreen pillars. It was beginning to look like an RAC job when, disconsolately, I pressed the accelerator pedal and the engine responded. Coughing and backfiring it belched out a cloud of black smoke from the exhaust and ran as sweetly as if there had been no trouble at all, even though it was still on three cylinders. I had no idea what the problem was. It happened three more times

before I reached Heysham and I was at the boat with only fifteen minutes to spare. The petrol consumption was 4.2 miles per gallon!

Once aboard the boat, I was able to borrow a spanner from the engine room and clean the plugs. A brief start of the engine showed that all four cylinders were firing. I looked forward with all the pleasure that a vintage car driver can muster, knowing that the difficulties are overcome and the exquisite pleasure of the drive is to come. The car was the last to board and stood on deck to one side of the gangway. Hooray, I would be first off. Wrong again – when the signal came to start up, YU 3250 wouldn't cooperate. I tried the Ki-gas pump to prime the cylinders. The pump wouldn't pump. The handle came up but wouldn't go back down to deliver the charge. It was necessary to dismantle it to unblock the jet. This took a half hour, during which time great inconvenience was caused to all others wanting to disembark. It is at times like this that sensible people lose patience with old cars and their owners. Eventually, the car started and I revved fairly briskly to avoid the possibility of the plugs oiling. Concentrating my attention on the revolution counter, I kept up the revs until the engine ran smoothly. Suddenly there was a shout of objection from the deck crew. Turning round I couldn't see them. They were completely invisible within a huge cloud of black oily smoke from the exhaust of the Bentley. I beat a hasty and embarrassed retreat. And so it was that YU 3250 was successfully started up and driven home in spite of her propensity for drama.

She was completely dismantled soon after arrival and given the necessary mechanical overhaul. The car was then used extensively during the following years for racing, rallying and hill-climbing. It covered many thousands of miles in Switzerland, Germany and France in addition to its journeys throughout England attending competitive events. In addition to the Nurburgring, it ran in the Mille Miglia and the Paris-Deauville Rally, which it won outright.

This Paris-Deauville Rally was run in heavy rain which varied only in its intensity throughout the three-day event. We started out from Le Havre in a convoy of four cars comprised of the Blower Bentley, a Renault, a Bugatti and a Derby Bentley. Ronald Barker had organised the trip. It was essential in his view that we stop for

lunch at a restaurant that he knew well en route. It was certainly a very good restaurant, so much so that we didn't leave until four o'clock in the afternoon with a long drive to Versailles before us. It had stopped raining when we set off with hoods down. By six o'clock it was dark and we were sitting in a traffic jam of major proportions. As far as the eye could see there were stationary red lights in our carriageway and stationary white lights in the opposite direction. Suddenly, and without the slightest warning, the heavens opened and we sat in a downpour, unable to do anything about it. There was no time to find suitable clothes and no point in putting up the hood – the car was already swamped. Some few minutes later the traffic began to move and we were able to pull off the motorway. In order to find our hotel, we hired a taxi to lead us, but on arrival it was discovered that the staff were on strike and there was no food or hot water. A change of clothes and the discovery of a good restaurant overcame our discomfort and, as always on these events, we had a very pleasant evening.

The entrants for the event included every type of car, from the grandest Rolls-Royce to the smallest cycle car. The occupants of each dressed in the period costume that suited their car. Marks were given for navigation, regularity in a speed test and finally the *concour d'élégance*. YU 3250 was the eventual winner, as we discovered at the evening dinner dance. Receiving the prize from Miss Gucci, I noticed that no one among the assembled entrants smiled or showed any pleasure. Our win, in a rather scruffy, well-used Bentley was popular with the natives, who adore ancient Bentleys, but received with indifference from the others. Undeterred, I played them 'Making Whoopee' on the mouth organ which I just happened to have in my pocket! Such events are rather more for posing than motoring. The Paris-Deauville was my first and last such event. Great fun, but not enough work to do.

MILLE MIGLIA

The Mille Miglia is more demanding. A thousand miles of Italian roads must be covered in three days. The route is divided up into sections which make early starts essential. The police cooperate fully to ensure a quick and safe passage through towns thronged with onlookers. The town squares are full of spectators, so it is necessary to pick one's way through carefully to avoid injuries. Somewhere within the event there is a competitive element, but it is said that one must be an Italian to win! With a two-ton car to manhandle through a thousand hairpin bends and mountain passes, Alex Boswell and I settled for enjoying the drive and, as ever, the excellent company one has at sporting motor events. In addition to the 1,000-mile circuit, we covered 1,000 miles out and 1,000 miles home again. This was completed in five days, including one day of 800 miles to enable us to catch an earlier boat home. As always YU 3250 never missed a beat while consuming 300 gallons of fuel on the journey.

It is true that however enthusiastic one may be, an old car can sometimes be very tiring, but only in the manner of a naughty child who is loved too much to be chastised for not cooperating with one's wishes. Some journeys, usually taken without a companion to help, are not always easily accomplished. I once spent an hour doing a clutch rebuild under a car at the side of the M6 near Birmingham at nine o'clock on a Friday evening in November. There are all the ingredients to challenge the versatility and determination of the vintage driver. My determination was really motivated by the certainty of not getting to bed that night if the car wouldn't run. To lie under a car on a filthy night with trucks driving past at 80 mph only feet away is a salutary experience for one who aspires to be master of his every vintage situation. My chief concern was for my new coat, which I had just purchased that afternoon. Needing something waterproof and warm for the journey I had stopped at Market Harborough to buy it. I explained my need and was fitted out with a beautiful green garment. I asked the proprietor if the coat was really waterproof. She explained that Captain Mark Philips wore exactly the same coat. That settled the matter in her mind, and after observing in the mirror a considerable improvement in my appearance, I was

pleased with my purchase. The coat certainly proved to be waterproof, windproof and oil proof. I doubt if Captain Mark Philips would have thought much of it after I had rolled it in the oil and mud for an hour, but I was grateful to him for my vendor's confident recommendation of it. In fifteen years, I have never had it cleaned. Now dark green and black it is a kind of coat of arms, displaying the thoroughly practical, down-to-earth, pragmatic unpretentiousness of the resourceful vintage driver always ready for emergency repairs and never dismayed!

I could tell many stories of problems with newly acquired old cars on the road, often hundreds of miles from home. But these almost always arise with neglected and unprepared cars, or cars needing adjustment to gain reliability. But one thing is certain with all old cars – they are never boring.

Driving an old car requires both intellectual and physical application if its best performance is to be enjoyed. It is in every sense a machine, and every part of it must be sensed by the driver. The steering must be direct and responsive if the car is to be steered precisely within inches of obstacles. The surface of the road must be felt so that skids can be avoided. The principles of gear ratios must be understood if silent changes are to be made. The gear lever cannot be casually pushed from one speed to another without understanding of the requirement of the road wheels' transmission and engine speeds. The brakes, often inferior in performance to modern cars, require an understanding of their characteristics under varying conditions. Anticipation is required to avoid sudden unexpected applications, as are commonplace in badly driven modern cars. On the road, the low revving long-stroke engines lope along in a most charming manner. They are unhurried, and undismayed by excessive revolutions, especially when climbing gradients. They are, when cruising, most soothing and relaxing to the mind, and their obvious mechanical response to the throttle is very satisfying. When required, they can show a good turn of speed and cruise at high speeds so that they can hold their own with modern traffic conditions. The true enthusiast will cover thousands of miles a year in his car, and it is generally true that once the charms

of vintage motoring are experienced they are never willingly set aside.

FAVOURITE CARS AND MOTORCYCLES

Daimler

The Daimler AC 1094 was built for the Earl of Craven in 1907. He requested that all the metal fittings be copper-plated, so it was then known as the ‘Copper Car’. The four-cylinder engine is of 10.6 litres capacity and permits a maximum speed of 80 mph at 1,200 rpm. The brakes are rather sketchy and it is important to keep a sharp lookout a long way ahead. It may be that the five different hooters are intended to assist others to get out of the way. Excepting that the wheels were changed from artillery to the new-fangled spoked wheels in 1914, the car is completely original.

While competing in the car at Prescott Hill Climb, I met the son of the original chauffeur to the car. He told me that his father journeyed with the car from Daimler’s factory in Coventry to the Earl’s abode in Buckingham. The plan was only to stay long enough for the Earl to learn how to manage the car himself. Some fifty years later the chauffeur died, still in the employ of the family.

It is a difficult car to start, and once on the road needs careful monitoring to avoid difficulties with steering and stopping. The cylinders, 2.5 litres each, are too big to allow hand cranking, and I find it necessary to stand on the starting handle in order to turn the crankshaft to charge the cylinder via the primitive carburettor. Occasionally, strong bystanders, anxious to help and at the same time keen to show their strength, have offered to crank it by hand. Few have succeeded! After four turns of the crank shaft to charge all four cylinders, the car will usually start by switching on the trembler coil. This merely showers sparks into the cylinder chosen by the distributor and, if the mixture is correct, the engine will fire. The speed is controlled by a hand throttle at the steering wheel. It is important to remember to close the throttle in an emergency. Failure

to do so will mean that there will be a tug of war between the engine and the feeble brakes, and the engine will win! As with all early cars, double de-clutching is necessary when changing gear. This is made most difficult by the hand throttle combined with very large gears in the gearbox, each with high numbers of teeth. Gear changing must be planned in advance to avoid any suggestion of hurry. Once the speed of the engine and the speed of the car are set for gear change, then it must be completed swiftly. Out with the clutch, out with the gears, into neutral, in with the clutch, out again with the clutch, in with the gear, in with the clutch, open the throttle. This sequence of events was described by Norman Brewitt, chief pilot of Manx Airlines, as ‘so remarkable a co-ordination of eye, hand, foot and ear that it was a privilege to be allowed to observe it’. It remains to say that if any component is incorrectly timed, the gear will be missed and the car brought to a standstill, while first gear is engaged to restart the process. But allowing for its idiosyncratic behaviour and its occasional bouts of sulking and refusing to cooperate, it is my favourite car, the car I would keep if allowed only one. With its hissing carburettor, exposed valve gear and whirring chain drive to the wheels, it has all the uncomplicated charm of a primitive creation and is the very essence of the horseless carriage. For that most enjoyable of all motoring experiences – just meandering through France with nothing more urgent to do than eating and drinking – it is the perfect car.

G.P. Itala Id 2301

The Itala is a 12-litre, four-cylinder racing car that was built for the Dieppe Grand Prix in 1908. With its use of shafts rather than chains for the drive to the rear axle, it was an advanced chassis design.

The engine, with overhead inlet and side exhaust valves, relied, as did all the other forty-six cars in the race, on sheer cubic capacity to raise the power required. The race was ten laps on over 480 miles of unmade road at speeds up to 100 mph. Simply to finish the course was a triumph for driver, mechanic and car.

The Itala finished eleventh out of the forty-seven starters and was then shipped to America where it competed in the Savannah races and, reputedly, Indianapolis, after which it was lodged in England.

In 1909, when it was in the hands of Mr H.T.L. Young, it was used for both road and track work. After this it was acquired by Mr R. Wild-de-Gose who was timed at over 100 mph in the car at Brooklands. After the First World War it was given to a friend who found it to be too fast for him and hurriedly sold it on to a Mr Pole who entered it for the VSCC speed trial at Aston Clinton in 1935. As a consequence of this, Sam Clutton (a founder member of the Club) showed a great interest in the car and was able to buy it in 1935. He then started a competition campaign with the car that lasted over fifty years and, by the time he died in 1992 aged eighty-two, he held every Edwardian record. While I had long been an admirer of the car, actual ownership of it had always seemed an out-of-reach dream. Yet suddenly, without warning, there came an opportunity to acquire it and I did so without a moment's hesitation. So far as my use of the car is concerned, however, its competition days are over. I am not a dedicated competitor – I get more pleasure from touring, especially on the continent where the roads are less crowded than in England.

The car has been to France on three occasions, to Belgium for the Ardennes circuit rally, and to Germany for the Gordon Bennet rally. Such social events are more appealing to me and, in any case, it would need a special sort of driver to make an impression on Sam's list of records. Truly a hero among cars, it has a giant stride, an easy 70 mph cruising speed and is just as responsive and dashing as it was almost a hundred years ago. This was reason enough for me to choose travelling in it for a very special occasion.

To celebrate the fiftieth anniversary of the founding of the Antiquarian Horological Society, of which Sam Clutton was a founder member, a meeting was held in Oxford. To mark Sam's contribution to horology and motor cars, I drove the Itala to the meeting with Andrew Crisford, who is also passionate about motor cars and horology. A fiftieth anniversary, I decided, was far too unique an

occasion to be passed by. The car and especially the huge engine attracted much attention from the clock- and watch-connoisseurs.

The saying that ‘there is no substitute for litres’ applies not only to lager drinkers but also to motor-car engines. The huge, slow-running engines of the Itala and Daimler have an effortless stride that induces a tranquillity in the whole of the car. The usual mechanical noises of the valves and cams working hysterically in smaller engines is reduced to a pleasant, rhythmic motion that gives the observer time to contemplate the function and enjoy the general commotion of naked, oily cams and gears actually seeming to revel in their measured contribution to the whole effect. I am very conscious of the mechanism at work. As a mechanic, moments like these – when the car takes on a personality of its own – are very special and pleasurable.

4.5-litre Bentley, mn 3740 (formerly kf 3740)

MN 3740 was bought in 1960. It was originally a long chassis, heavy and cumbersome 4.5-litre coupé. The body, very fashionable in 1930, was so heavy as to ruin the performance, road-holding and brakes. Its interest to me lay in the chassis, engine and gearbox, which, being of late manufacture (1930), were stronger and more suitable for competitive events. I used it as a closed car in the winters of 1960 and 1961 and then, because the body was rotting away, I dismantled it and began rebuilding.

This task was more complex than a restoration. The chassis was shortened to make for livelier handling while the engine was specially tuned to produce more power. A new body was required, with all the paraphernalia of mudguards, hood, windscreen and interior fittings. The car was extensively used for racing, rallying and hill-climbing, as was XV 6293, and made several trips to Paris and the watchmaking areas of Switzerland. When parked in the Place Vendôme, George Brown would invite his friends to come and see it, and to meet his friend ‘the English artist’, who could restore both watches and cars. And so we both gained a little prestige!

In 1994, after thirty years of trouble-free use, the car was again dismantled for repainting and alterations to the chassis and engine. Because the body had been rebuilt in 1962 as a replica short-chassis Birkin Le Mans car, I decided to complete the replica with supercharger and appropriate alterations to the chassis, mudguards and fuel tank. The work was completed with the correct form of dashboard and instruments, all specially made for authenticity of appearance. The finished car was very fast and could show 3700 rpm in top gear (about 105 mph), but having a short chassis it tended to flirt with bumps and ruts (the general condition of most road surfaces today) so that concentration was essential. After forty years it was reluctantly sold as one Bentley too many.

Alfa Romeo 032 man (formerly bxv 506)

I bought the 1932 Alfa Romeo 8C supercharged out of the proceeds of the sale of YU 3250 which had been my faithful steed for some twenty years. There are so many beautiful things in the world to admire and enjoy, and one cannot acquire or keep them all. Some, however, are very special and worth far more than a passing glance. I was happy to have my signature in the log-book of YU 3250, but I felt it was time to move on.

An Alfa Romeo, I decided, would fit the bill for a light, fast sports car if I could find a good original example. As it happened, Gregore Fiskin had just such a car, a 1932 8C that had started life as a Le Mans car driven by Sir Henry Birkin and Lord Howe. A race-leader until the early hours, it was then stricken by misfiring and withdrew from the contest.

Peter Hull, VSCC historian, suggested that it ran at Brooklands in August 1932 when, having thrown a rod, it once again had to be withdrawn. Lofty England, who I believe was working for Birkin at that time, described this blow-up as ‘comprehensive’. Nevertheless the car was prepared for racing and was driven by Lord Howe to a class win in the Ards TT. In this drive, he set a record time but was beaten by the excessive handicap given to smaller cars. After the

race, the car was shipped back to Italy where it passed to Guiseppe Campari, it is said, in lieu of wages! Campari immediately had another body made in the form of a drophead coupé which he sold to Italo Balbo, Mussolini's Air Marshall, and an enthusiastic motorist. He used the car as a moving platform from which he could extol the virtues of the Italian Air Force, notably his armada of seaplanes and their crossing of the North Atlantic without incident or accident.

When I bought it, the car was in the most appalling condition and needed a total strip and rebuild. The original body was a four-seater with two doors and long chassis touring body especially designed for Le Mans. I wanted this put back and ordered a new body from Rod Jolly. As he had the Mike Hawthorn 1931 car to copy he did a perfect reproduction job. It was obvious that the engine had been rebuilt recently because the bearings and pistons were in bright, unused condition, although the pistons were seized on to the gudgeon pins. The restorer had modified the oil feed from the pump by sealing the connections with O rings. These had immediately been sucked into the crank-case, blocking the oil ways and thereby leaving the working parts without any lubricant.

A complete rebuild was necessary and, because I had more urgent things to do, the work was put out. It took a full six months to complete and was such a first-class job I couldn't bring myself to complain about the bill. Many years ago I concluded that one must accept that 'the purchase price of the car is the down payment on the rebuild'. Every motor enthusiast will echo these words at some time in his career. On this occasion, though, they became indelibly engraved on my mind. The Alfa Romeo remains my most expensive engine rebuild ever. But, of course, it was worth it in the end for, when finished, the car was a huge delight with light, quick steering, powerful brakes and feather-light handling.

Its first outing was with the Manx Motor Racing Club's Isle of Man race meeting. Due to the high axle ratio that I had chosen for touring it was not competitive in the races, but performed well in the various sprints when the high axle was complimentary to the first-gear ratio. Its first foreign jaunt was to Belgium where we had fun

racing on an airfield. This was the first long run to test the car's reliability and no problems were experienced.

The advantage of the high gear was pronounced in Sicily where nine days were spent celebrating the ninetieth birthday of Alfa Romeo. Again the ease of handling and the acceleration through the gears was astonishing to somebody who was raised on relatively heavy Bentleys. In 2002, during three days of rain, the Alfa Romeo ran in the Mille Miglia. This was not a very comfortable occasion, although my hastily contrived hood was successful.

The 8C Alfa Romeo is regarded as one of motoring's great classics. I agree. It certainly makes a great impression on me.

Bentley R Continental 38 bmn (formerly olx 36)

A great favourite of mine is the 1953 Bentley R Continental. I bought this in 1975 as a therapeutic exercise in rebuilding after several weeks' treatment for cancer. Each morning I attended Middlesex Hospital at 7 a.m., arriving by motorcycle. This brought back memories of the early 1950s, when I rode a motorcycle every day from Edgware to Croydon. On one occasion, looking carefully over my shoulder when changing direction on a slippery tar-block surface which covered most London roads in those days, I turned back to find a young lady hanging on to my bike. She had stepped into the road and collected me, or perhaps I had collected her. She had a damaged leg and was taken to Middlesex Hospital. On the way home that evening I visited her. She was most apologetic about the event but felt that it must be fate that threw us together. I felt it safer not to visit again! Now, here I was, again visiting Middlesex hospital on a motorbike, and London in the early morning was still just as beautiful as it had been forty years earlier.

During the weeks of the treatment I dismantled and rebuilt the Continental so that it, and the treatment, were finished at the same time. The results, successful in both cases, were celebrated by a tour of France and Switzerland in the car, which behaved impeccably.

The ease with which the Continental will cover vast distances without discomfort to its occupants is now legendary. It is silent, smooth and spaciously comfortable. At the cool, thin-rimmed steering wheel one looks along a long, slender bonnet reaching proudly into the distance. The controls are beautifully weighted so that one can sense the road and the car's response to changes in surface and conditions. And, of course, it is very beautiful to behold.

So, if the car is so good, why do I now drive a Bentley Turbo R for long continental journeys? The answer is that the density of modern traffic makes bad-weather driving difficult in old cars.

Once, when heading for Heysham and the ferry boat to the Isle of Man, I had driven from Cornwall by a long circuitous route to take in several appointments on the way. My left leg and right shoulder were tired from gear changing in heavy stop-and-start traffic. In Leeds I was stuck in a traffic jam, and as I sat there, longing for arrival in Heysham, the words of Lawrence Pomeroy, motor correspondent and bon viveur, came back to me. When testing the Continental in 1953 he wrote: 'This car is a magic carpet which will carry its occupants to the ends of the earth and when they alight, they will be as fresh as when they set out.' At that moment, however, I felt I could have swapped mine for anything with power steering and an automatic gearbox. Such is the difference that passage of time makes to the luxury of a bygone age. But I cannot bear to think of disposing of the car, which still has many uses and, of course, remains the most beautiful of all Bentley saloon cars.

3/4.5-litre Bentley, xv 6293

I bought this car forty years ago from Tom Quayle, a Martin's Bank manager in Cornwall. With my friend Alan Burns, who owned a 3-litre Van den Plas tourer, I went down to view it. It was also a Van den Plas, with a fabric-covered wood frame, a classic coachwork for sporting Bentleys. It was fitted with a 4.5-litre engine and was therefore described as a 3/4.5, which is often regarded as the best of the sporting models. It had obviously seen a lot of use and was

looking rather tired in some areas, but to my inexperienced mind it went very quickly. I bought it there and then and we drove it home to south London. My bank manager, who had lent the money to buy it, tried to look benign when he saw it the next day. Looking back I realise that it did look rather scruffy, but I was entranced by it and saw only its magnificence. I gave him a ride up the steep nearby hill and demonstrated the huge torque in top gear which was a delight to me but which he wouldn't have noticed if I hadn't described it to him.

Highly pleased with my purchase, I set out to restore it to its original condition and finish. Once again, I visualised only the beauty of the finished car as I started a new Bentley regime similar in labour to that earlier described with the Landaulette. But this was far less work and six months later, finished with grey body and maroon chassis, it was ready for a busy life of touring and competitions. In the next two years it covered some 27,000 miles and was driven in races, hill climbs and driving tests. It was sold in 1962, the money going towards the purchase of the house in south London.

The Birkin Single-Seater uu 5871

The red single-seater Bentley was the first of three supercharged Bentleys built for the Birkin Team. Originally a four-seater to comply with Le Mans regulations, it was re-bodied as a single-seater for Birkin's use as a Brooklands track car. It took the lap record at 137.96 mph in 1932, a record which still stands for a series production motor car. It was converted to a two-seater in 1945, but the original body was preserved and refitted in the 1970s. I have used it at Silverstone, Isle of Man, Donington, Oulton Park and the Prescott Hill climb. It is quite unsuited to any of these venues on account of its length and weight, but as said earlier, I drive only for the fun of the event and the congenial company in the paddock. There are many historic cars locked away in garages because the owner is too uninterested to exercise them or thinks they are not suited to modern race circuits. One has an obligation to allow

enthusiasts to see these cars occasionally, and what more congenial occasion than a competitive event?

Getting the single-seater to and from the events is a tiring business, for it is very cramped and the pedals are awkward to reach. There is only room in the cockpit for the driver and a small handbag, into which must be fitted all that one needs for a stay of a few days at the venue. I am fortunate in having a large number of friends dotted about the world, so the loneliness of the single-seater on a long journey is compensated for in the evenings. Apart from the steering, which is heavy due to the low steering wheel, making it difficult to turn, it is a surprisingly easy car to drive. It hates traffic jams and will boil instantly if allowed to run slowly. This can be a cause of anxiety on long runs, especially on motorways, which are becoming increasingly congested. Because the radiator and header tank are so small in the interests of reduced frontal area it is necessary to keep a close eye on the temperature gauge. If it boils and water is lost it can be either a long walk or a long wait to replenish it. As with every old car or motorcycle I own or have owned, the single-seater was dismantled and completely rebuilt. This is the only way to be certain of reliability and safety. The completed car was then fitted with spare wheels and quickly detachable mudguards to make it road legal. For all its inconvenience it is a most exhilarating car to drive both on the road and on the racetrack, and it is always driven to events under its own power.

Bentley Turbo R

The Bentley Turbo R is one of the fastest and most luxurious of modern saloon cars. Its performance is phenomenal and its acceleration has been described as ‘like a tidal wave’. The luxurious interior is fastidiously finished with the finest leather, emphasised by the prominence of the stitching. The whole impression is that only the best is good enough for a Bentley.

I bought my Turbo R in 1995, thinking I would use it for drives between Liverpool and Hay-on-Wye. Its swift silent progress requires

little input from the driver. The controls are featherweight and the ride is luxuriously lazy. When seeking to overtake a crocodile of four-to-five cars trailing a heavy-goods vehicle at 40 mph, its abilities are sensational. But, as there is always another slow-moving vehicle ahead, it is often less exhausting to follow the leader in air-conditioned comfort while enjoying the CD player hidden in the boot.

When I first drove this car in heavy rain on the A49, it responded to any acceleration necessary for overtaking by swinging its tail out. I had expected that there would be a limited-slip differential to control this, but further experiments suggested that there was no controlling mechanism for this behaviour which, in a Bentley, is undignified.

Later in the day, thanks to this problem, I found myself stuck on a grass verge with one wheel that kept spinning, preventing my escape. Only a helpful push from a kind man saved me from further indignity. Enquiries at Bentley motors revealed that there was, in fact, no differential lock in the axle. Considering the cost of the car, and the power available, I found this almost unbelievable and felt cheated. Further discussion resulted in a part-exchange of the differential and the problem was cured. The modern solution is traction control, but Bentley was always a little reticent when it came to modernising anything.

Rolls-Royce

The classic Rolls-Royce motor car has never had much appeal for me. Concerned first and foremost with silence of running, they are somewhat underpowered and, like the two Phantoms I have owned, thirsty on petrol. My first Rolls-Royce was a Phantom I which, at some time in its life, had been converted to a hearse (not uncommon for Phantoms in the 1930s) and then re-converted to a tourer in the 1960s. I bought it simply because I had never owned one and because I was assured by Rolls-Royce enthusiasts that they grew on one. Mine was stolid, heavy, low-geared and very thirsty, and it made an alarming rushing noise due to the under-geared commotion that went on under its bonnet.

It never grew on me and I was pleased to sell it to the late Jimmy Sanders, Chairman of James Walker Jewellers. He was so pleased with it that he allowed me to select a gold Riverside pocket watch for myself from his huge collection of such watches bought in as old gold and stored in his offices in Streatham. The Waltham Riverside is the most beautifully finished of the Waltham watches. My nephew Stephen Neal, a noted philosopher at Harvard, was in need of just such a watch for his waistcoat so I gave it to him. He continues to show his appreciation of Jimmy's gift by wearing it on important philosophical occasions.

My second Rolls-Royce was a Phantom II. It was bought, like so many of my purchases, on impulse, simply because it was a most handsome car when its coachwork was completely restored. I have to say that the aesthetics of collectable objects represents a large part of my interest in them. When you consider that the only merit of a motor car is that it can carry one over the surface of the earth quicker than one's legs, it is essential for it to be beautiful if it is not to become just another boring old utility.

Driving the Phantom II to the Isle of Man was a protracted and expensive business. At Watford it boiled furiously and came to a stop. A passing motorist stopped and enquired about my plight. He, too, was a Rolls-Royce owner and he guided me to his specialist who, after applying a powerful hose to the radiator, declared it blocked and in need of a new matrix. As he needed to keep the car for these repairs, I had to fly back to the Isle of Man.

A month later the car was ready and I was able to drive it home. On the road the car proved to be disappointing. Like the Phantom I it was noisy and heavy to drive, tended to weave at speeds above 50 mph and at this speed it vibrated and the rushing noise returned. Clearly the coachwork had been the restorer's priority while the engine had received only a good scrubbing to make it presentable.

Even when the engine was completely restored, the car's performance was still disappointing. It was also rather discouraging to be told by an enthusiast that it would be better to keep the speed to about 50 mph at which revolutions the vibration was hardly

noticeable. Although the steering gear was in first-class condition, the tendency to weave remained a problem.

The late Brian Morgan, a noted car restorer, claimed that Phantoms didn't steer well because Royce never drove them! Speaking of my car, the late Sam Clutton said: 'I wouldn't want to drive this car through a narrow gap at speed'! I found it a truly disappointing car, but the person I sold it to has never complained.

In my view, Rolls-Royce was not very progressive when it came to car design. The meticulous engineers would go to near-impossible lengths to turn a simple component into an indestructible unit, but this added nothing to the development of the car and, over the years, this approach made the car increasingly heavy. In my opinion, the weaving problem of the Rolls-Royce is caused simply because the front wheels are vertical to the road surface. If a very few degrees of camber were added to the wheels this would ensure that they would run in a straight parallel line. In Royce's time, though, a wheel that was not upright was considered unsightly and suggested a fault. The Daimler Company who were building cars at the same time as Royce, however, were in no doubt about the advantages of the 'drunken wheels'.

At the end of the 1920s Rolls-Royce and Bentley became rivals. The cause was Bentley's 8-litre engine which was smoother, faster and quieter than the old-fashioned Phantom II engine. The opportunity for Rolls-Royce to acquire the engine came with the 1929 Wall Street Crash which bankrupted Bentley Motors who were then acquired by Rolls-Royce. There is much controversy surrounding this acquisition and there were many comments made at the time. Some of these were generated by Bentley supporters who wanted to continue under the Napier banner. Plans were made and drawings prepared, but the Rolls-Royce victory stifled them.

Looking back, it is probable that the economic set-back in the car market and Napier's declining interest in them would have meant the end of the Bentley motors for all time. In the event, not only did Rolls-Royce save Bentley's name, it was the only company who could afford to do so, and Bentley himself was pleased with the cars built by Rolls-Royce in his name. Rolls-Royce never did make use of

the beautiful 8-litre engine, though, and at the time it was reported that the unsold engines were broken up for scrap.

Walter Owen (W.O.) Bentley was also acquired by Rolls-Royce for the remainder of his contract with Bentley Motors and was set to work as a motor-tester. Did the irascible Henry Royce intend this to be an humiliation for W.O.? I cannot help thinking that it was a form of gloating! W.O., on the other hand, was a gentleman who, in my view, demonstrated this by concluding his test report on the new Bentley car with the comment: 'I have enjoyed driving this car more than any other bearing the same name'.

Also lost were the many trophies won during the previous twelve years. With one exception, which Woolf Barnato, Bentley's favourite driver chose to keep, all disappeared without trace.

Rolls-Royce Bentleys appeared in 1932. Although they were lighter, quieter, smoother, elegant and glamorous, they never appealed to me.

Motorcycles

I bought my first motorcycle in 1949 at the suggestion of my friend Peter Hamdorf, who could ride them but couldn't afford to buy one. He taught me to ride, and with it we were able to travel further and faster than on the bicycles. That was the end of bicycles for me until 1980 when the new Hetchins was built.

The motorcycle was most useful in crossing London every day to work in Croydon, and to classes three evenings a week. It was sold in 1950 and it was not until 1972 that I purchased another. In the heavier traffic of the 1970s and 1980s the motorcycle was most beneficial. The journey to Sotheby's was completed in some twenty minutes, while long journeys to North Yorkshire from London gave the wonderful feeling of unrestricted travel that had been enjoyed in the 1950s.

The thought of competition on a bike never entered my head. They are much more demanding than motor cars and I knew I was incompetent on fast twisty roads. On one occasion I was allowed a

few circuits of Brands Hatch on a 250TZ Yamaha race machine and while I enjoyed it and was complimented by the owner, my trembling hands told me that motorcycle racing was not for me.

MV Agusta

The very fast MV Agusta 750-cc, twin-camshaft, four-cylinder machines were raced extensively in the 1960s and 1970s, winning hundreds of races and many world championships. They can reach a speed of 140 mph. I find it top-heavy at higher speeds and have never explored the effects of its maximum speed!

Sunbeam S7

Introduced by Sunbeam Motorcycles in 1946, principally as family transport with a sidecar. Motoring for the masses was still twenty-five years away and motorcycles were very popular. These machines were regarded by the average young motorcyclist as tame and lacking in thrill to ride. Most young riders believe that the motorcycle must be driven hard and very fast, even to the point of danger. But in fact a motorcycle can be a most enjoyable touring machine, offering great freedom of movement to the rider and his passenger. Between 1949 and 1951 I covered thousands of miles on Sunbeams with ease and comfort and never a sign of accident.

Norton

One of the most famous names in motorcycling is Norton. There is no important race that they could not win, and they have done so many times. For sentimental reasons only, I bought a 1949 Clubmans TT model to ride in the Isle of Man. Their charm is in their light weight and response to the rider’s commands. But they are difficult to start and the brakes are not up to modern requirements unless driven at moderate speeds. I was once told by an

experienced TT rider that one of the reasons they were so fast in races was because the brakes were unable to slow the machine!

BMW

The BMW machines are heavy and tall so that when manoeuvring on foot (motorcycles have no reverse gear) they are clumsily top-heavy. But when cruising on a motorway they are in a class of their own. This machine was used for journeys to London from the Isle of Man and could cruise effortlessly with good weather protection and comfort. Another is kept in London for summer use in the city.

Postscript

This book will mark my eightieth birthday but not, I hope, a slowing of my activities. Indeed, I plan to continue for as long as I am physically able to do so and have increased the number of motoring events for the year.

The watches also continue to fascinate and I have now developed an interest in clocks so that there is plenty of interest in daily life.

I suppose one might be allowed to retire at eighty years of age. Thinking it might be the fashionable thing to do I did contemplate it at seventy-five but found my time so taken up with administration of trivia that the only escape was to go back to the workshop and do something worthwhile. I shall continue to enjoy that for as long as I am able to work.

October 2006

Working with George

MY JOURNEY TO WORKING WITH GEORGE

My first meeting with George was unforgettable. The year was 1988; I was eighteen and was in the second year of a three-year course at the Manchester School of Horology. One morning, our head lecturer announced that the following day we would be visited by a watchmaker called George Daniels. When told that he made every single component of a watch by hand, as an immature student of horology, this news was received with some scepticism.

My doubt was short-lived and the following day, in the middle of a technical drawing lecture, in came George Daniels. My attention was immediately caught by his impeccable three-piece blue pinstripe suit, highly polished black shoes and a gold pocket-watch chain with a key at one end, threaded through a button hole and with the other end tantalisingly falling into the pocket of his waistcoat. He walked around the desks, meeting and examining the students' drawings and finally coming to rest by the end of a row of watch benches. There he was quickly surrounded by students asking questions, and this was the moment that I asked if I could see what was on the end of his pocket-watch chain. Without hesitation George reached into his pocket and pulled out the most incredible piece of work that I have ever seen – his Space Traveller.

The day ended with George delivering a lecture to the students and members of the Manchester branch of the British Horological Institute. The talk was extraordinary and covered the hand-making of his various pocket watches, watches which housed his many ideas for the improvement of the mechanical time-keeper. That evening,

my eyes and mind were opened to an area of horology that I, and indeed no one else there, had had any insight into before – a new world that had been created entirely by George Daniels.

Our next meeting was two years later. Whilst employed as a watch-repairer fitting batteries and repairing bracelets (work which no longer held my attention) the excitement and romance that I had witnessed on that memorable day at college kept coming back to me. One day, probably after the umpteenth battery change, I decided that I would write to George Daniels and ask if he would employ me as an apprentice. The letter was sent, and several weeks later a response arrived which noted that he did not want to employ me but asked whether I would like to visit the Isle of Man to discuss my future.

A date was set, and I was picked up from Ronaldsway airport by George in his 1954 Bentley Continental. On arriving at Riversdale, George took me into his basement where with great animation he allowed me to handle several priceless pieces from his watch collection. In no time at all it was lunch and we were back in the Continental en route to his local pub for fish and chips where he gave me a grilling on my watchmaking aspirations. I spluttered and stammered my way through some form of response which I felt left George feeling a little dismayed.

Back in the car and down the road to Riversdale where we returned to George's world: his workshop. He spent the next hour or so explaining the various pieces of equipment and some of his working practices. As the conversation began to draw to a close, George returned to the question of my future and asked if I still intended to make my own watches to which I replied that I still wanted to but did not know how. He explained that he had always preferred to work on his own and that watchmaking at this level is not something that can be taught, and basically, if you have the passion to succeed then it will come naturally – perhaps not quite what I had hoped to hear. On asking if I had a lathe to get started, and my replying that I did not, he rooted around in a cupboard and pulled out a beautiful old mandrel lathe which he explained would be perfectly satisfactory for turning out the plates of my first watch.

George delivered me back to the airport feeling somewhat dazed by his generosity and the day's events, but now knowing what I wanted to do for the rest of my life.

I next met George in 1992 after the completion of my first pocket watch, a time-only piece which housed a one minute *tourbillon* and spring-detent escapement. As my companion throughout the build, I used George's masterpiece, *Watchmaking*, a book which instructs the budding watchmaker on how to make a pocket watch from start to finish. The watch had taken me eighteen months to make; it was a struggle from the start right through to completion, and it bore its life for all to see.

Arriving at Riversdale I was greeted by George, who ushered me into his dining room where he asked to see what I had been up to. I passed him the watch and his face did not light up as I had naively hoped. He suggested, with some exasperation, that we should go to his workshop for a closer examination. On further inspection, his mood did not improve as he began to question why I had not taken greater care with the watch's construction and aesthetics. After explaining some of the difficulties that I had encountered he did appear to rally slightly. He suggested that I should take some consolation from managing to build a watch that worked and perhaps now that this daunting task was complete I should put the watch to the back of the bench, forget it, and start another. However, this did come with the strict instruction that I focus on every single aspect of creating a great handmade watch.

The following five and a half years of my life were spent obsessively perfecting every single aspect of watch component construction and having remade another watch some four times while perfecting the thirty five or so trades which are involved in the creation of a truly handmade watch, I knew that I had reached my limit and it was time to make another trip to the Isle of Man.

This meeting was not as easy to secure, as George was busy working with Omega on the industrialisation of his Daniels co-axial escapement, but in the summer of 1997 the date was set, and again I found myself knocking at the front door of Riversdale. George answered and barely acknowledging me he ushered me into his

kitchen where the table was strewn with paper work. I stood in the corner for what seemed like an age as he continued to sort his paperwork, and then he grunted, ‘Well, let’s see what you have been up to.’ We walked down to his workshop situated in the grounds of Riversdale and on the way he commented on what an appalling attempt my first watch had been and did I really think that I could have conned him into believing that it was good. He then asked if this watch was any better – I said nothing!

We entered the workshop, and with an atmosphere that could be cut with a knife, I placed the watch on the bench in front of George. He picked it up and began to turn the watch over in his hands. There was complete silence for a minute or more and then he asked, ‘Who made you your case?’ – to which I replied, ‘I did.’ This was followed by: ‘And the dial?’ – ‘I did,’ I replied. He then turned the watch over, opened the back, and began the examination of the movement through his eyeglass. Again there was silence and then the questions started again: ‘Who made your escape wheel?’ Again, I replied, ‘I did.’ This was followed by more questions such as: ‘Who made you your spring detent?’ and, ‘Who made you your *tourbillon* cage?’ – ‘I did,’ I replied to each. There was a momentary pause and then George stood and with one of his big toothy smiles he said, ‘Congratulations, you are now a watchmaker!’ And with that, George started to pace around his workshop talking over the finer points of my watch and discussing how best I might further my career. By this point I was not paying any attention, because I was so relieved – twenty minutes earlier, as I had walked down his drive, I had been contemplating what I should do with the rest of my life if George did not accept my work.

An hour later and after a cup of tea we parted on good terms but with the advice that although I had made a very nice watch, it still lacked stylistic cohesion, which could only be improved by studying what had been created in the past and gaining more making experience which would eventually lead to me finding and developing my own style.

For me, life returned to normal and I continued with my usual trade repair work and started to plan some sort of future in

watchmaking. Then one day the phone rang and it was George Daniels. He said that his co-axial escapement had been taken on by Omega and that as a result he wanted to celebrate the achievement of having his escapement accepted by the Swiss watch industry by creating a small series of watches based around the Omega *ébauche*. He thought that he could sell perhaps ten or so pieces and that the project would take one year to complete. He went on to say that he would like some assistance and that as I had shown promise would I like to move to the Isle of Man to work with him. I didn't hesitate, and said yes – well I had to, it isn't every day that the great George Daniels phones you up.

We arranged for me to visit George for a meeting to discuss the terms of my employment, where a date was set for me to start work on 2 January 1998.

WORKING WITH GEORGE AND THE MILLENNIUM PROJECT

My first day arrived and I walked into the workshop to find George cleaning down one of his Schaublin-70 lathes. We shook hands and wished each other a happy new year, and then I spotted the prototype wristwatch that we were to make. It was beautiful and I was immediately struck by its unmistakable elegance. The niceties were soon over; I set my tools out on my work bench and then we got down to business.

There was a lot for me to learn, a new boss, workshop and working to a new scale. What must be remembered about George and his working methods was that at no time throughout his career was there any use of computerised machinery to aid him. Instead, the quality and fit of every single component made within that workshop was totally reliant upon the individual skill of the person making it.

Although difficult, the previous seven years had made me familiar with the various challenges faced as I hand-made two pocket watches to tolerances of 0.01 mm to 0.02 mm – which can be

achieved with fairly rudimentary tools and measuring equipment. A wristwatch is in a completely different league, with tolerances of 0.002 mm to 0.003 mm. This terrified me. Fortunately, George's workshop was very well kitted out, and with George as a teacher I hoped that all would be well.

The first nine months were incredibly intense as George instructed me in the use of his equipment and working methods, and with the large amount of developmental work that is required to make a series of watches.

As the connoisseur-world of watch collecting heard the news that George Daniels was, at the age of seventy-two, to make his first series of wristwatches, the orders came flooding in and within a very short space of time we were looking at an order book of sixty pieces and then giving a name to the watch: The Daniels Millennium.

What was of great interest to see were the many tools and machines throughout his workshop which are so expertly illustrated in *Watchmaking*. More enjoyable, though, was seeing George's written words that I had followed for so long being acted out in front of me as he demonstrated various techniques with a clarity and calmness that was a pleasant surprise to me, the new boy in the workshop.

One of the tasks that I had to master was the making of hands; not easy, when the only tools available were a piercing saw, a few files and a piece of peg wood for steadying the work. My work progressed slowly, especially when told that I had to hand make fifty seconds hands, which along with the fifty hour, minute and calendar hands, all had to be hand pierced from a sheet of 0.3-mm-thick gold and then filed to a width of 0.3 mm whilst trying not to bend them. I started, but due to the finesse of the hand I did not get very far, believing that it was an impossible task.

Telling George this, he sat at his bench and put on his glasses, ushering me to bring him the troublesome seconds hand for inspection. George had very large hands but he picked up the seconds hand with ease and deftly slipped it into his pin vice. He then picked up a needle file which was swallowed by his shovel-like hand. It was extraordinary to see that, as he brought the seconds

hand to rest on the peg wood, there was a fluid change as his rather agricultural-looking hands transformed into those of an artist as he simply began to caress the excess metal away with his file. Within half an hour, sitting there before me was a perfect seconds hand, hand-finished by George – and with a very useful lesson to me.

Another challenge that had to be mastered was engine turning, a trade which watchmakers just do not learn – unless you are George, that is. As always the tuition was flawless, but I struggled to get a grip on the finer points of the process for some months and as the pile of ruined silver test pieces grew into a small mountain, George simply ignored me, knowing that all I needed was time and practice, although on occasion he could not help but let out a low growl as he passed, while I sat struggling with the straight line engine.

Fortunately, I did progress and with my growing ability George felt that he could enjoy a couple of weeks away motoring with friends through France in his recently completed 1932 Alfa-Romeo, leaving me with the task of completing nine dials for his return.

They were completed and I proudly laid them out for inspection. George returned and as usual visited the workshop prior to dropping his bag in at the house. He sat down – no cursory hellos – put his glasses on, and asked me to bring him the dials for inspection. He took his time, inspecting each one for the quality of engine turning and fit of the various dial components. On completion he reached for his red marker pen and put a large red cross on 6 of the 9 dials. Putting the pen down he looked over his glasses and said, ‘I think, “Smith of Bolton”, you need a little more practice.’ And with that, ‘Daniels London’ stood and left the building.

As I grew more accustomed to the work and the first pieces were delivered, George started to ease off and allowed me the freedom to take control of the project. He was never far away though, and always kept an eye on my progress or assisted whenever I came across some difficult area of the project. George always had an innate ability to spot an error in my work, even from across the workshop. I always felt that he could sense it before actually seeing it.

The watches steadily left the workshop and in 2001, with all watches complete and with a wealth of knowledge under my belt, I left George to set up my own workshop with a view to making watches under my own name. To make the transition easier George gave me a lifeline and asked me to make him two rectangular-cased *tourbillon* wristwatches under the Daniels London name. Again a very useful lesson was learnt with this (my first major commission): time management. The pieces were completed in three years, which in George's view was too long.

Over the next few years George and I kept in regular contact, and we either met for lunch or when I called round to the Riversdale workshop to use his engine-turning equipment. On occasion, and if there was sunny weather, George would take one of his cars out for an airing and we would be alerted to his imminent arrival by the growl of some super-charged Bentley or Alfa as he flew down the final half-mile approach to the workshop. He always took a keen interest in the goings-on of the workshop and enjoyed speaking to my growing team of watchmakers, although he always took great amusement in telling me and the team that if you wanted a proper watch then Daniels was the only option.

THE DANIELS ANNIVERSARY

In 2009 George approached me with an idea to create a new series of Daniels co-axial escapement watches. It had been thirty-five years since George's conception of his escapement and so the series was to be restricted to thirty-five pieces. This was an important change in direction for George, as the previous series (the Millennium) used an Omega base calibre with Daniels modifications. This Anniversary series was to have a completely new English calibre designed and made in its entirety on the Isle of Man using, where possible, the Riversdale workshop and made to George's exacting philosophy and standard.

George laid down the basic watch specification for a manually wound wristwatch with the usual minutes, hours, seconds, fitted with

an up-and-down and calendar mechanism. In recognition of my work on the project I asked if I could fit my single wheel version of his co-axial escapement into the series, a modification which guarantees concentricity and the correct angular orientation between the upper and lower sets of teeth during their assembly – he agreed!

With George having spent well over sixty years at the watchmaker's bench and having created, in my view, the world's greatest body of work, there was plenty to draw from for the technical and stylistic elements. Of further consideration during the design phase was George's famous mantra as to what the basic requirements of a great watch should be, which is, that it should contain historic, intellectual, technical, aesthetic and useful qualities for it to be a success.

Initially I was apprehensive as to whether I should join forces with George again, in part because I was fully committed to my own business, and because George, at the grand age of eighty three, was still a formidable taskmaster and did not care to hear that other people had priorities greater than his. Nevertheless, it is not every day that the master asks you to make him a series of watches, and so I listened and readily accepted the challenge.

The design phase began in earnest and I started to collate dial, case and hand designs. On completion of these I would make the seven-mile journey to Riversdale for a consultation with George. After lengthy discussions, modifications were made and the long process of me hopping between workshops with drawings for the prototype Anniversary wristwatch began. Once George was happy that the designs were correct, he asked me to make him a 'dummy' watch consisting of a case, dial and hands fitted with a disc of brass, simulating the approximate weight of the movement, which enabled George to sign off the work on the aesthetics, weight and feel of the watch.

In November 2010 the watch was launched at London's premiere watch exhibition SalonQP. The 'dummy' Anniversary sat resplendent between George's Space Traveller and *tourbillon* chronograph pocket watch, which was the inspiration for the dial layout of the watch. George took centre stage on the opening night

and expertly handled the press and client interest. The exhibition was a great success and alerted the world's watch connoisseurs that Daniels was in business.

On our return from London, the design work continued on the movement – a lengthy and difficult process, made all the more challenging because of the need to create a watch which had to sit effortlessly alongside George's great body of work.

One particular difficulty was the design of the case. In my Series 2 wristwatch, I (like many other watchmakers) use several screws to secure the case back in place conveniently. During one particular meeting George scrutinised my Series 2, then he looked up and passed the watch back to me, saying that the case-back screws looked rather industrial and that on the back of his Anniversary case, I must find a better and more elegant solution! After many months of trial work a solution was found whilst maintaining the crucial Daniels case style and the water resistance of the case.

The prototype was completed and we set a date for its examination. I arrived at Riversdale and, to my surprise and pleasure, George could not find fault with the piece. We sat and chatted about the project for some time, enjoying a coffee and one of his favourite Mr Kipling's Bakewell tarts. The forthcoming SalonQP 2011 show was discussed along with George's participation on the launch night.

All was very cordial, when George's face changed and he asked if I was intending to display just the one watch at the exhibition. I said, with a hint of apprehension, 'Yes.' George replied, saying, 'Now come on, Roger, this is our chance to show to the world that we are the best and in business to make watches; therefore we need to let people really see the craftsmanship. I think you need to make another movement.'

I attempted to protest, explaining that I still had three of my own watches to complete for the show, but George never allowed a trivial problem such as a shortage of time to stand in the way of achieving a goal, and before long I found myself having agreed to complete another movement. The atmosphere calmed and we continued to chat about other matters. Finishing my Bakewell tart I told George

that I had better get back to my workshop as my workload had somehow dramatically increased!

I was halfway to the door when George shouted out: ‘Roger, did I say one movement? You had better make that two – after all, people need to see both sides!’

On 21 October 2011 George sadly passed away, just two weeks before the completed prototype was to be shown publicly for the first time. Work carried on without interruption, just as George would have demanded, and in November 2011 my work sat alongside George’s very first in-house production wristwatch at the SalonQP event at the Saatchi Gallery, London. With clients travelling from as far afield as America and Hong Kong, the reaction was yet again phenomenal. It was also a perfect environment to chat freely about George’s life and incredible achievements in horology with many very kind words and condolences being voiced.

As for the future of Daniels London, to my great surprise and pride, George passed the entire contents of his iconic workshop to me in order that I complete the anniversary-collaboration watch series and continue to maintain and, if necessary, restore his main body of work which comprises some twenty-three individually handmade pocket watches and four wristwatches, as well as the sixty Millennium watches I assisted him with.

George’s philosophy is extremely important and I will continue this through my own work, never compromising quality and individual handwork for speed, mechanical intervention or ease of production. I promised George that I would make sure that he will never be forgotten, and although of course that would be impossible, I will be making sure that his legacy of the horological artist-craftsman – where one man is responsible for the conception and creation of a complete watch from start to finish – is never lost.

Since my very first meeting with George at the age of eighteen he has had a profound effect on my life and it has been a great personal honour to be able to share a few select memories from my time spent with my mentor and friend, George Daniels.

ROGER SMITH

2012

Afterword

At the time of George's death he was contemplating reprinting *All in Good Time*, particularly as 2010 and 2011 had been such active years. Sadly, this plan was not to be completed in his lifetime and, as a result, I have been asked to write the final chapter of this new edition.

George and I first met fifty years ago when he came to me for advice on building a garage at his recently purchased house. The garage was to be used for his vintage Bentley collection. As a vintage-car enthusiast myself, this was too good an opportunity to miss; so started many years of shared interest driving and restoring cars.

It was perhaps inevitable that I would take an interest in horology. My first clock was a wedding present from George, and I was privileged to watch and learn from him in the early years in his workshop.

Office administration was the bane of George's life. Not a day went by without the postman delivering a mountain of correspondence, all requiring replies and work which kept him away from his workshop. It was with this task in mind that George asked me to help in managing his day-to-day affairs. I readily accepted, and for many years made regular visits to his beloved house Riversdale, in Ramsey on the Isle of Man. The sheer magnitude of George's daily workload, and his ability to deal simultaneously with many subjects, was truly amazing.

It started to get very busy in the Daniels household when, in late 2009, he received a letter from Her Majesty's Cabinet Office inviting him to accept the CBE in the Queen's 2010 New Year Honours List. A formal announcement was published in the *London Gazette* on 31

December 2009, the citation reading, ‘Master watchmaker for services to horology’. He is the only watchmaker ever to have received this honour.

Requests for articles and interviews from all over the world came flooding in, and the first formal event was a reception at the Isle of Man Government House when the Lieutenant Governor, His Excellency Vice Admiral Sir Paul Haddacks and Lady Haddacks celebrated George’s award. In his speech, His Excellency referred to the monumental contribution George had made to the horological industry and his being acknowledged as the world’s greatest living watchmaker. He also made special reference to the enormous kudos George had brought to the island as the world’s centre of excellence for handmade watches.

It was then on to Switzerland, where Omega hosted an exhibition at Baselworld to celebrate ten years of their use of the co-axial escapement, together with a reception hosted by Nicolas Hayek (Chairman of Swatch Group). During the fair, the Horological Academy of Independent Creators celebrated its twenty-fifth anniversary. As one of the founder members, George was received with great acclaim and was in constant demand throughout the event. A celebratory book *The Hands of Time* had been printed, and to quote from the book: ‘It is impossible to exaggerate the influence George Daniels has had on the world of mechanical horology. His legacy is colossal.’

On 21 May 2010 the CBE Investiture was held at Buckingham Palace, where HRH The Prince of Wales invested George. It was a magnificent occasion with all the pomp and circumstance one would expect. The day ended with a celebratory dinner at the Royal Automobile Club in London, where George entertained friends and horological colleagues.

In June 2010, a remarkable event was held in London when François-Paul Journe, the celebrated watchmaker, hosted a dinner to honour George for his achievements and creative inspiration. Journe presented George with a homage timepiece made especially for him.

For some time, George and Roger Smith had been in discussion regarding the joint production of a celebration watch to mark thirty-five years since George's invention of the co-axial escapement. Roger, George and I spent many hours together in George's workshop finalising the design and detail of this watch. The initial prototype was launched to great acclaim at the SalonQP event held in London. The first working prototype was displayed the following year (2011) at the SalonQP event held at the Saatchi Gallery in London, and was considered by all to be the star of the show.

George's health deteriorated in 2011, but in spite of this he continued to work both in the workshop and garage, taking every opportunity to use his extensive collection of vintage cars. Despite the health scares, George made several visits to London, staying at the RAC Club. On his last visit, the Birkin single-seater 'Blower' Bentley was displayed in the Rotunda and was one of the most popular cars displayed in the club that year. Indeed, at the RAC summer event held at Epsom, the car won the Judges' Special Award.

In August 2011, George celebrated his eighty-fifth birthday when a very special dinner party was held with friends at Riversdale. Sadly, George's health deteriorated further and, on 21 October 2011, surrounded by close family and friends, George passed away peacefully at his beloved home Riversdale.

George's funeral took place at Kirk Christ Church, Lezayre, Isle of Man. Over 150 people were present to pay their respects. The horological world was represented by people from all over the globe, and several of George's vintage cars were used in the cortege. Roger Smith paid a very moving tribute, as did Roger Collins, the past President of the Vintage Sports Car Club.

In April 2012, a memorial service was held at St George's, Hanover Square, London, when more than 270 people attended to celebrate George's life and work.

It was a great personal privilege for me to accept George's request to be the first Chairman of the George Daniels Educational Trust. This has been set up to provide bursaries for students in medicine, engineering, building construction and horology. The main

beneficiaries are candidates recommended by City University London, and the Worshipful Company of Clockmakers jointly with the British Horological Institute. Thus, a lasting tribute to this remarkable man is ensured.

Daniels London Ltd. will continue with the completion of the collaboration watch in Roger Smith's workshop. Another part of George's legacy, his books, will be reprinted and kept in print by Daniels London Ltd.

I, and many others, have been inspired by George. His intelligence, his passion for learning, and triumph in all the subjects he tackled have left an indelible mark. He was an extraordinary friend, sadly missed but always remembered.

DAVID NEWMAN
2012

Dr George Daniels, CBE, FBHI

1926–2011

COMPLETE WATCH AND CLOCK PRODUCTION

Pocket Watches

1. A gold and silver one-minute pivoted-detent chronometer *tourbillon*. CC.
2. A gold one-minute spring-detent chronometer *tourbillon*. RAM.
3. Ditto. SB.
4. Ditto. EMH.
5. Ditto. CHE.
6. Ditto. SJD.
7. Ditto, with a reserve of winding indication. TE.
8. A gold one-minute spring-detent chronometer *tourbillon*. GSS.
9. A gold one-minute Daniels spring-detent chronometer *tourbillon* with fifteen-second remontoire and equation of time.
10. A gold watch with Daniels independent double-wheel escapement. SGA.
11. A gold watch with Daniels independent double-wheel escapement.
12. Ditto.
13. Ditto.
14. Ditto.
15. The first Space Traveller's watch.
16. The second Space Traveller's watch.
17. The first Daniels co-axial watch.

18. A gold one minute *tourbillon* with Daniels co-axial escapement.
19. Ditto.
20. A gold pocket chronometer with Daniels slim co-axial escapement. DLR N-C.
21. A gold pocket chronometer with Daniels slim co-axial escapement.
22. The Daniels Grand Complication watch.
23. A gold Daniels co-axial four-minute *tourbillon* with chronograph.
24. Pocket watch (at the time of George's death he was working on a gold watch with a one minute *tourbillon* and a fifteen-second remontoire with co-axial escapement. The watch is 65 per cent complete and will be finished at a later date by Roger Smith.)

Wristwatches

1. A gold four-minute *tourbillon* with Daniels slim co-axial escapement and Daniels compact chronograph mechanism.
2. A gold double-dialled one-minute *tourbillon* calendar with Daniels slim co-axial escapement.
3. The Blue. Rectangular-cased one-minute *tourbillon* with co-axial escapement.
4. The White. Rectangular cased one-minute *tourbillon* with co-axial escapement.

The Millennium Wristwatch

1. A gold prototype with ETA slim Daniels co-axial escapement.
2. A total of fifty-two gold automatic wristwatches, with date and Daniels slim co-axial escapement.
3. A total of seven white-gold automatic wristwatches, with date and Daniels slim co-axial escapement (inc. one watch signed Daniels London and R.W. Smith).

[General Note: Wristwatches customised by GD not included in listing]

Chronometer

1. The first piece made by GD (based on a Thomas Mercer chronometer).

Clocks

1. Two Breguet three-wheel Skeleton Clocks.
2. Four Daniels Grasshopper escapements, fitted to long case regulator clocks.

TOTAL PRODUCTION

23 pocket watches (plus one unfinished)
4 wristwatches
53 Gold Millennium wristwatches (incl. prototype)
7 White Gold Millennium wristwatches
1 chronometer
2 three-wheel clocks
4 Grasshopper conversions

DAVID NEWMAN
June 2012

GEORGE DANIELS

CBE, 2010

MBE, 1981

Liveryman and Past Master of Worshipful Company of Clockmakers
Hon. Doctor of Science (City University, London)
Fellow of the Society of Antiquaries of London
Fellow of City and Guilds Institute (Hons)
Fellow and Past President of the British Horological Institute
Hon. Fellow American Watchmakers–Clockmakers Institute
Hon. Life Member Swedish Watchmakers' Guild

AWARDS

Tompion Gold Medal
BHI Gold Medal
CGI Gold Medal (Craftsmanship)
Kullberg Medal for Horological Science
The Arts, Science and Learning Award, City of London
City and Guilds Insignia Award, London

BOOKS BY THE SAME AUTHOR

Watches (1965)
Clutton and Daniels
English and American Watches (1967)
The Art of Breguet (1975)
Clocks and Watches (1975)
In the Collection of the Worshipful Company of Clockmakers
Clutton and Daniels
Clocks and Watches (1980)
of the Salomons Collection
Daniels and Macarian
Watchmaking (1982)
Registrar of Freeman of Clockmakers (1984)
The Practical Watch Escapement (1994)

Plates

Grandmother and Grandfather on right. I met them only twice when they were older.

Aunt Ettie (centre) at her Cosy Cafe, in Hackney, presumably decorated for the coronation of Elizabeth II. A most kindly and determined woman, she opened the cafe to support her invalid second husband.

Most of the Daniels family. I am not included, being, as usual, away from home for the day. My eldest sister, Eileen, left home at seventeen and joined the Anti-Aircraft Gunners.

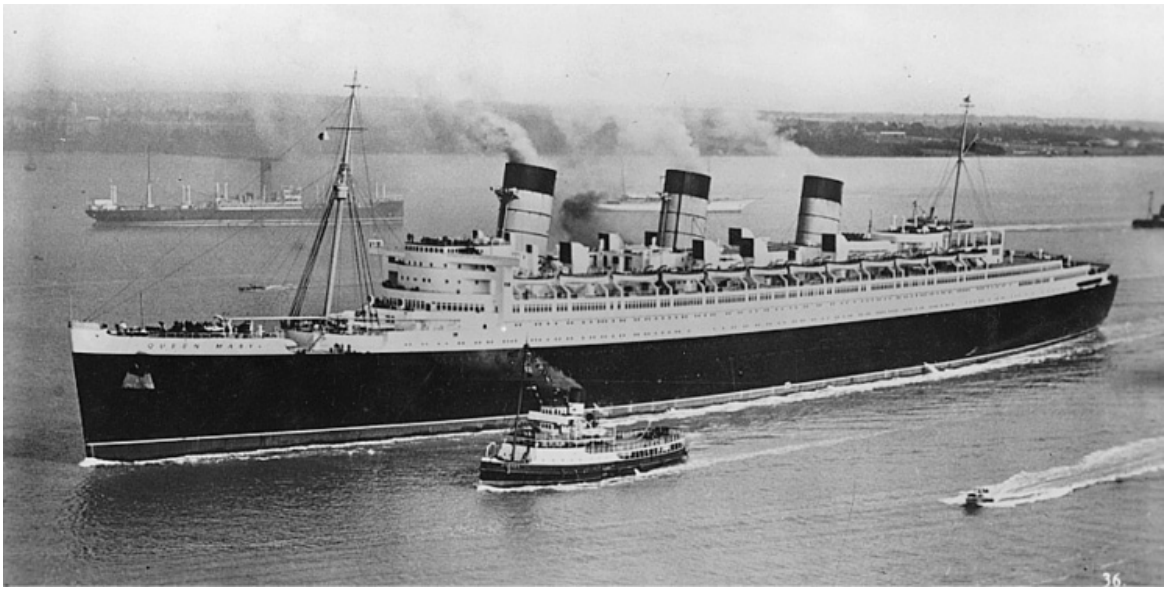
14846910 Pte. Daniels in 1944. Eighteen years old in the East Yorkshire Regiment. This photograph was taken by Mr Dixon in his original studios shop at 135 Station Road, Edgware. A far cry from the huge business that Dixon's has now become.

The Back Lane playground. On the left, the doors that secreted the booky's runners from the police. On the right, now closed, the barber's shop (4d for a haircut, 2d for a shave) the cat's meat shop, the cafe (1d for a cup of tea), and the second-hand clothes shop.

The flat above Mr Ashley’s garden shop, No. 24a, on the left. In an emergency I would carry a bucket of water from Mrs Fluid at 26A.

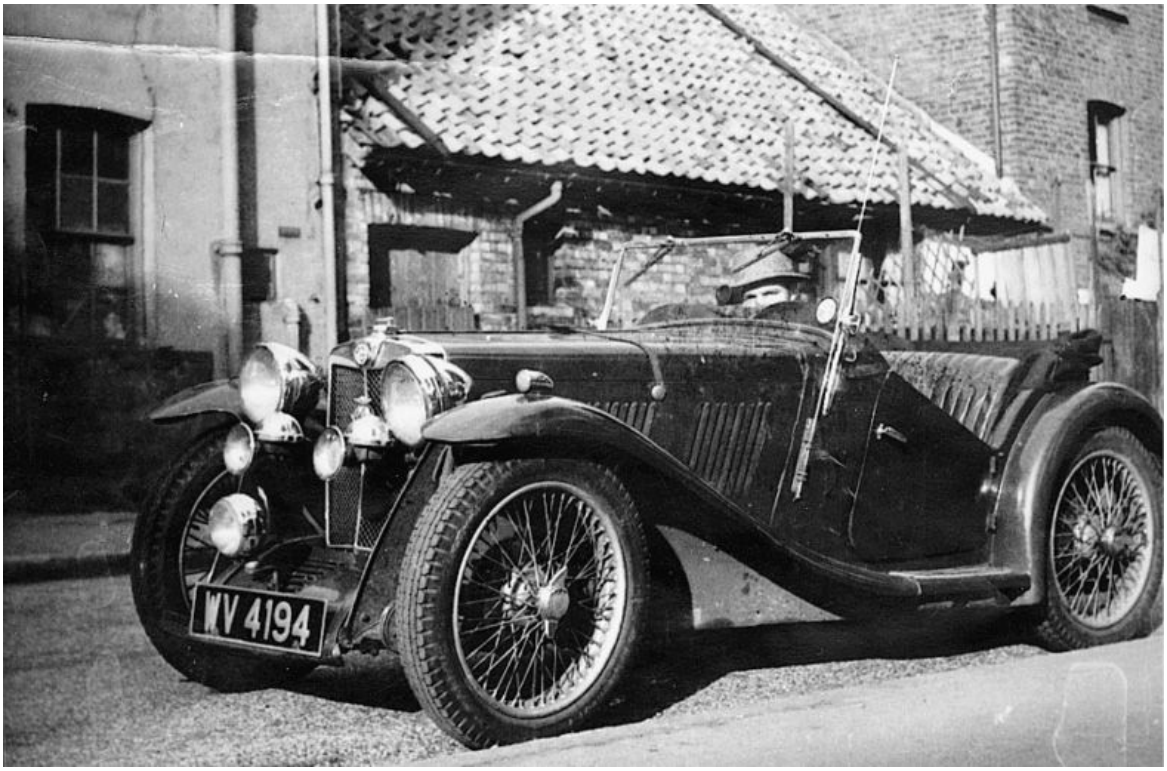
The steps lead down to Back Alley and made a relaxing seat for the bookie’s runner.

Mother in full regalia with my father. Presumably at the wedding of one of my many sisters. I attended only one, at which my father, unable to provoke a quarrel with me, started one with another guest. I left before it was fully developed and do not know what was the outcome. A handsome woman, my mother never lost the desire to please her husband, while complaining bitterly at his treatment of her.

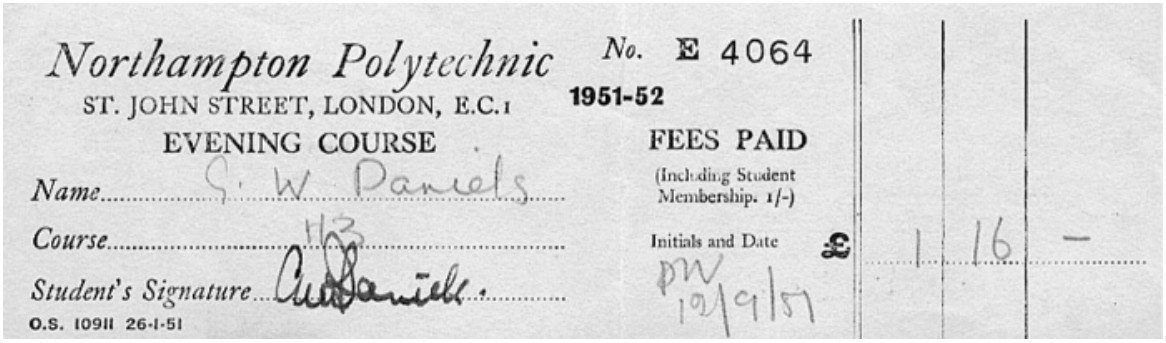


The magnificent Cunard *Queen Mary*, whose launch boosted the morale of the nation in the 1930s. I drew and painted many pictures of her to decorate the classrooms of my school. They kept me popular with my teachers in spite of my bad class work.

Egypt 1946, my first watch-repairing bench in a bedside locker. In this confined space enough money was made to avoid drawing army pay for two years. The money was eventually spent on the tools needed for my first professional job as a watch repairer.



My first car, 1932 M.G. J2, bought in 1951. Within two hours of ownership the crankshaft broke and set me on a career as an amateur motor mechanic.



Northampton Polytechnic
ST. JOHN STREET, LONDON, E.C.1
EVENING COURSE

No. E 4064
1951-52

FEES PAID
(Including Student Membership. 1/-)

Name S. W. Daniels
Course H3
Student's Signature S W Daniels

Initials and Date PW 12/9/51

£ 1 16 —

O.S. 10911 26-1-51

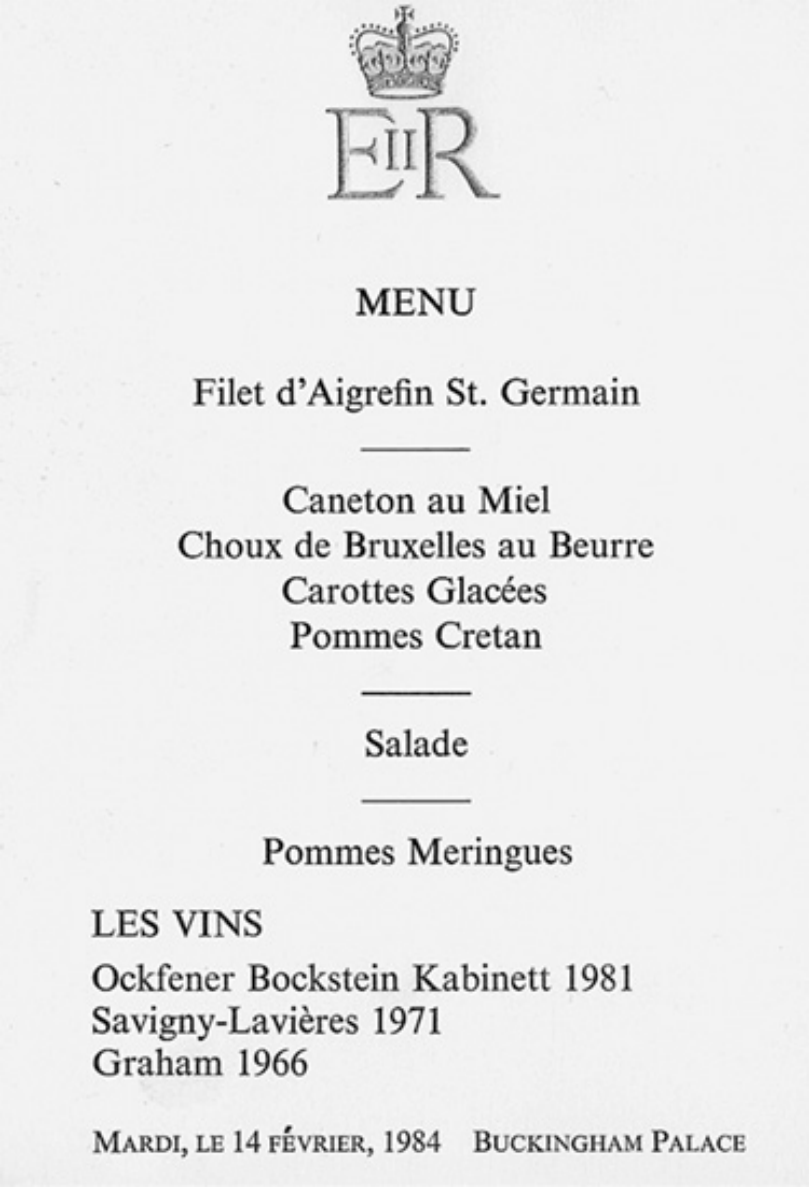
1951, receipt from the Northampton Polytechnic for the three-year horological course in the sum of £1 16s.

From Studland to the Hamble in tranquillity aboard the *Larne*. In the foreground Robert Marryat, the skipper, and his wife Jean.

Prising a tune out of one string of the Lady Blunt Stradivari violin. In the background, the Antide Janvier astronomical clock restored in Sam Bloomfield’s workshop.

The chronometer was my first manufactured piece, made to justify three years of study at evening classes where we were not considered capable of working to such standards of quality and complexity. The picture on the left shows work on the marine chronometer made with the blessing of Frank Mercer in 1952; the middle picture is of the movement of the completed machine. On the right is a dial and mahogany box made from wood salvaged from a Victorian sideboard.

The wedding with Juliet Anne Marryat at Esher, Surrey, on 13 June 1964.



EIIR

MENU

Filet d'Aigrefin St. Germain

Caneton au Miel
Choux de Bruxelles au Beurre
Carottes Glacées
Pommes Cretan

Salade

Pommes Meringues

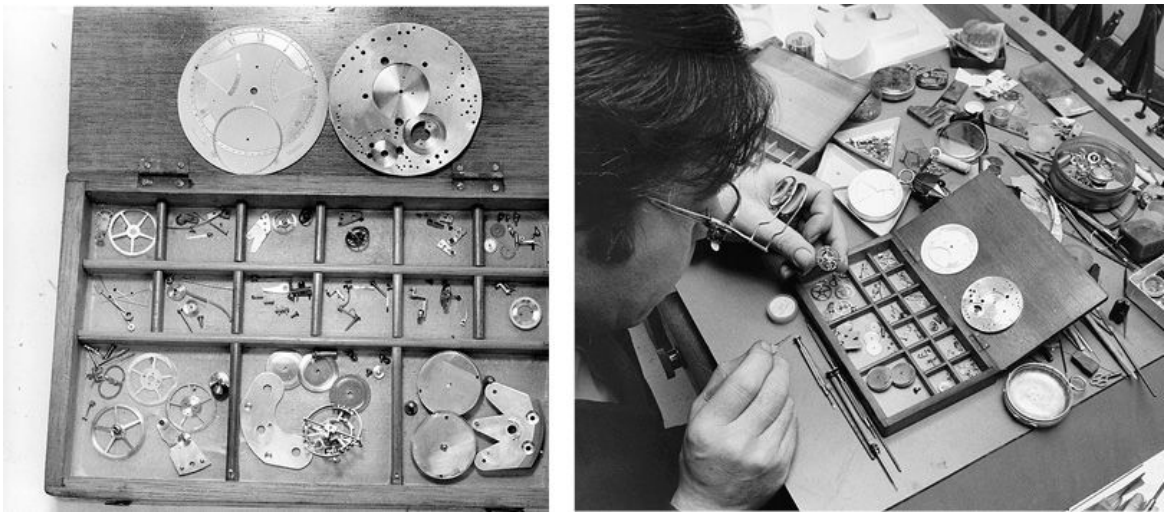
LES VINS

Ockfener Bockstein Kabinett 1981
Savigny-Lavières 1971
Graham 1966

MARDI, LE 14 FÉVRIER, 1984 BUCKINGHAM PALACE

For those who are curious to know what the Queen gives her guests for lunch!

At Buckingham Palace in 1981 with my wife Juliet and daughter Sara to receive the MBE from the Queen.



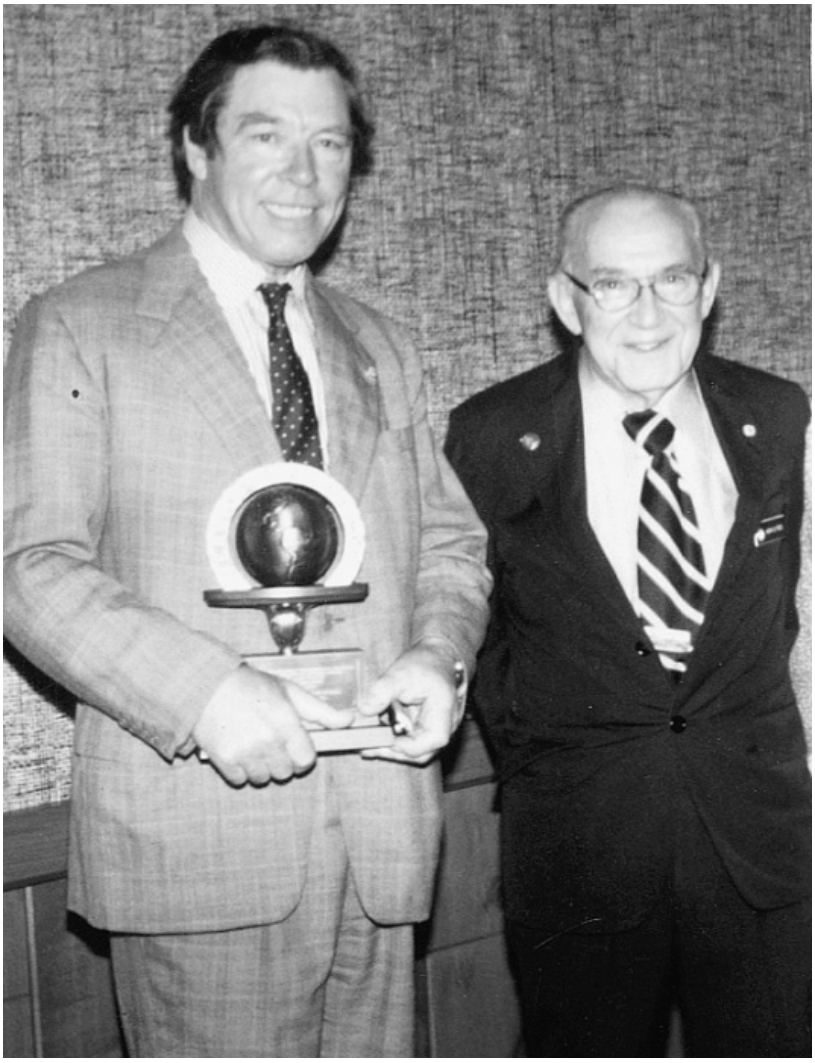
Bird’s-eye views of a watchmaker’s bench. Each of the components seen in the compartmented box is produced from the raw material. The case is made in 18K gold and awaits final engine turning and finishing. The completed dial lies on the lid of the box with the main plate of the movement. The *tourbillon* carriage, held in the left hand is complete and ready to go. At this stage the watch represents some 2,000 hours’ work.

The late Peter Wilson CBE, doyen of auctioneers, presiding over the Robert von Hirsh sale at Sotheby's rooms in London, 1974.

With Tina Millar, centre, my boss at Sotheby's, and Darren Schnipper of Sotheby's New York, at Geneva where the sale included a Daniels watch seen in the advertisement… The watch, which originally cost £25,000, sold for £85,000.

Guiding Sir Harold Wilson through the watch collection of the Worshipful Company of Clockmakers, at Guildhall, London.

Newly appointed ‘Agent of Breguet’ with George Brown, the proprietor of Maison Breguet. Paris 1964.



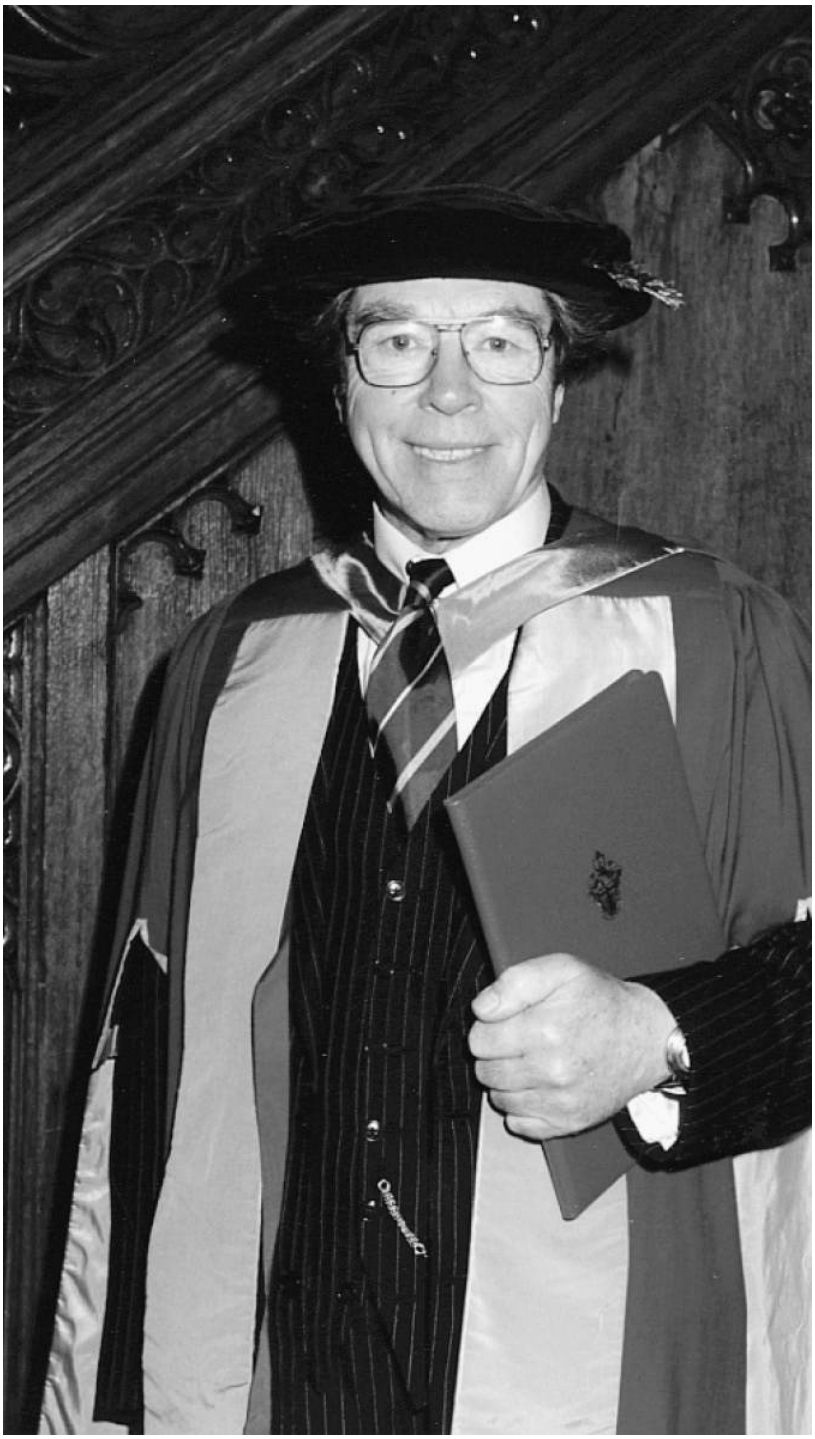
Receiving Hon. Life Fellowship of the American Watchmakers Institute from Henry B. Fried. Henry worked at the bench for 70 years and died in 1996 aged 86.

Receiving the ‘Arts, Sciences and Learning’ award from Sir Hugh Wontner, Lord Mayor of London 1973–74.

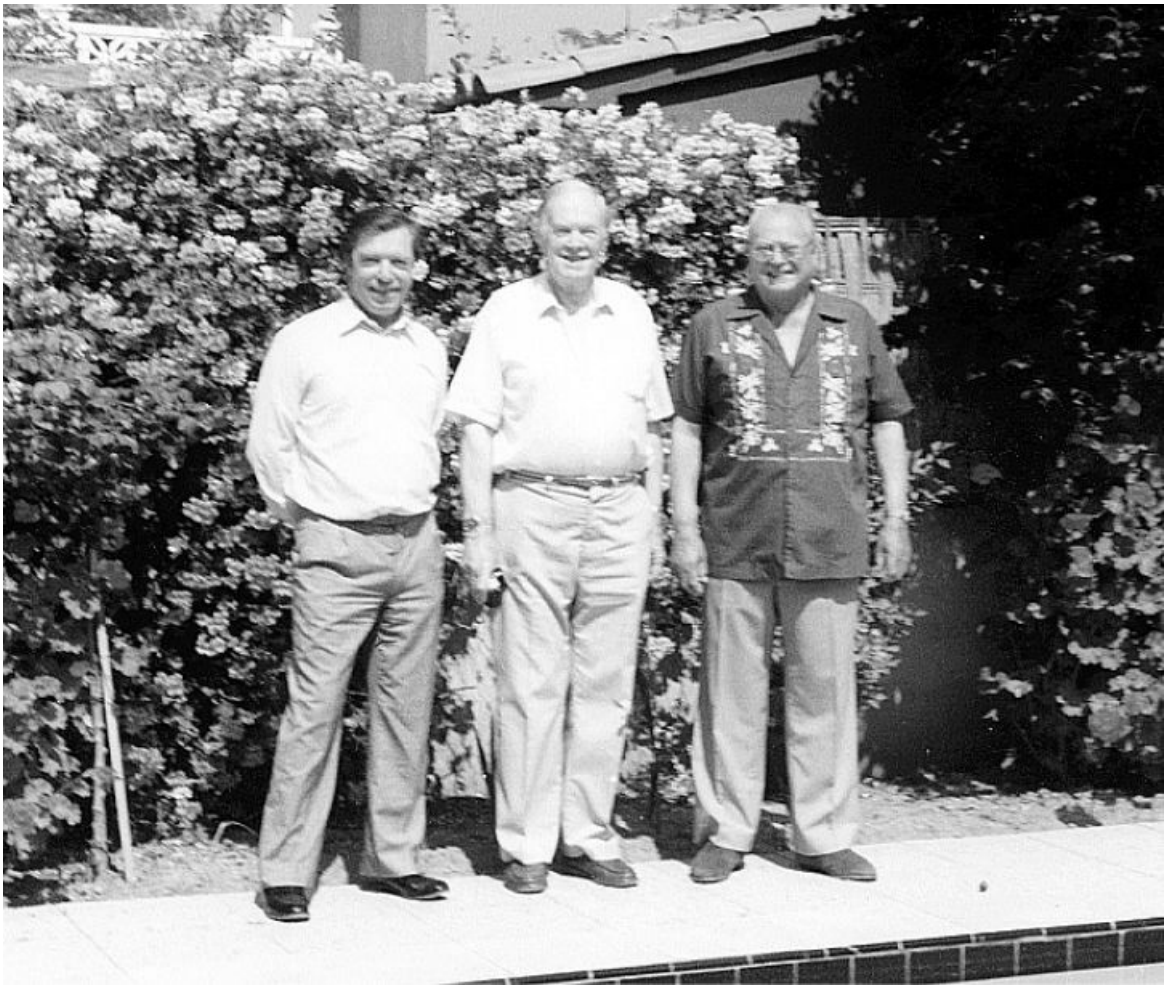
Watchmakers and students from Europe and America are welcome to visit the workshops. This group is from Ireland.

Informal lunch party with the late Lord George Harris and his wife, Dolly, in the orangery at Belmont House. His magnificent collection of clocks and watches is on view to the public in the house, which is now a National Trust property.

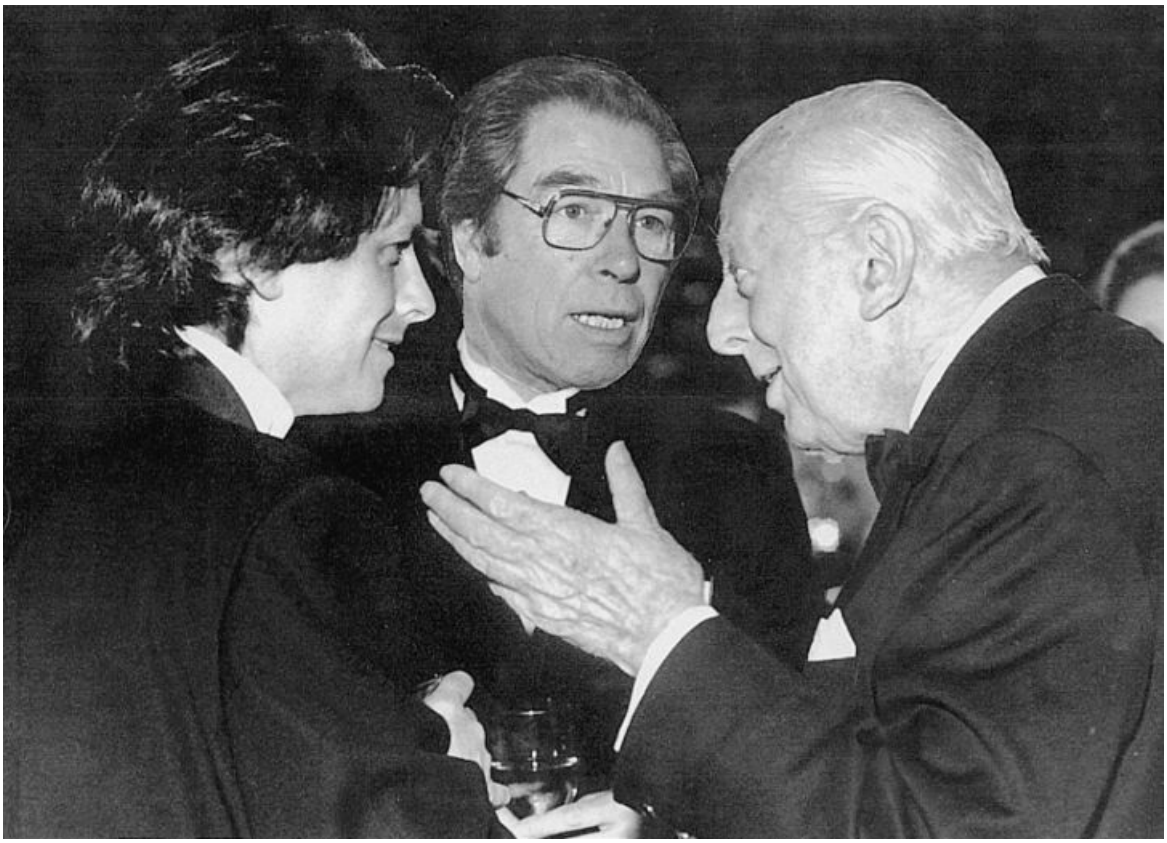
With Derek Pratt and Kilian Eisenegger of ETA watch-movement makers in Switzerland. Kilian played a leading part in the preparation for industrialisation of the co-axial escapement.



Hon. Degree of Doctor of Science from City University, London Guildhall, 1994. The tie was bought for six shillings at the old Northampton polytechnic in 1951. It seemed appropriate to wear it on this occasion.



R.V. ‘Reg’ Jones centre with his wartime assistant Major Andrew Fell, right, who was appointed head of the new National College of Horology in 1950. He devised and constructed the first British ‘black box’ for recording flight data.



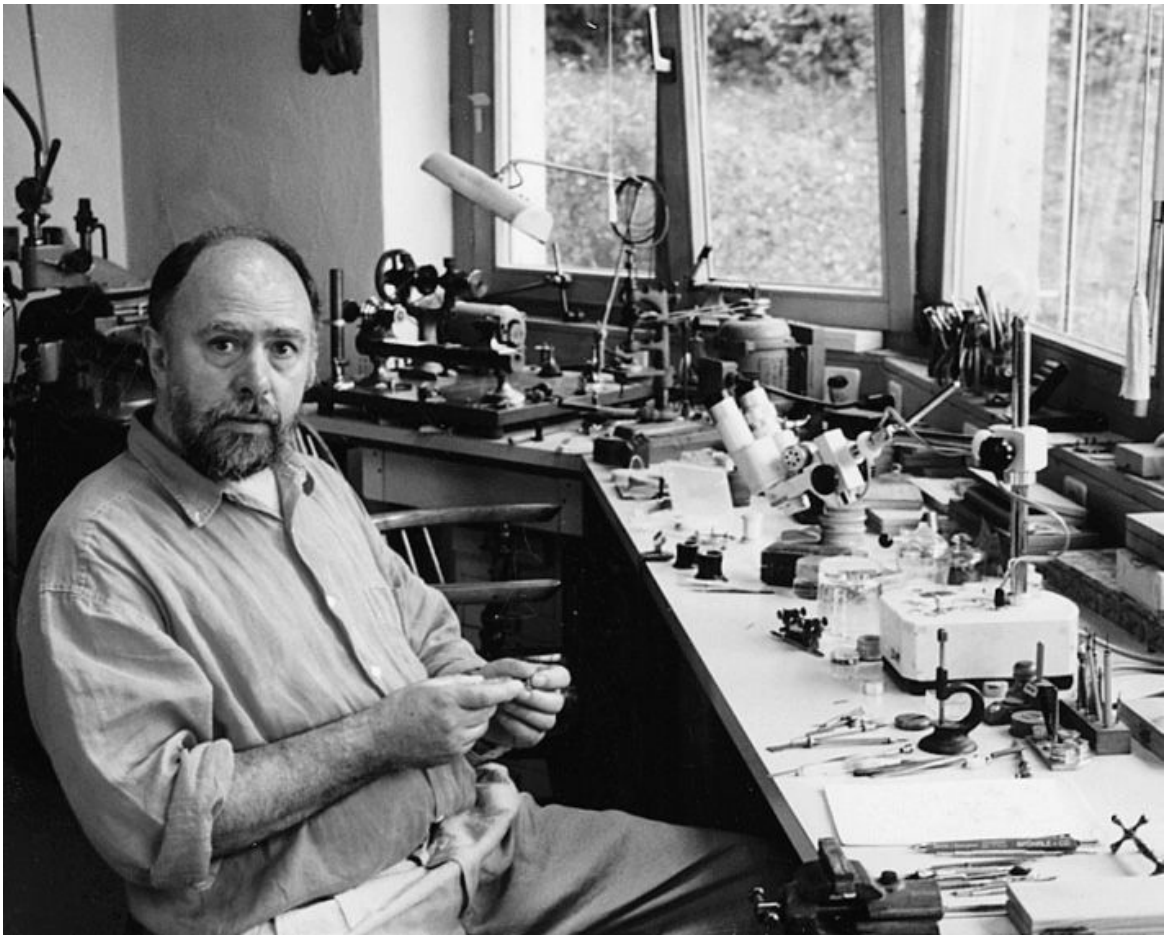
Alistair Cook of *Letter from America* fame and William Andrewes, curator of Scientific Instruments at Harvard University, where I gave the annual James Arthur Lecture and chose to speak on the subject of watchmaking in the 21st century.

Carol Vorderman examines the co-axial escapement for ITV.

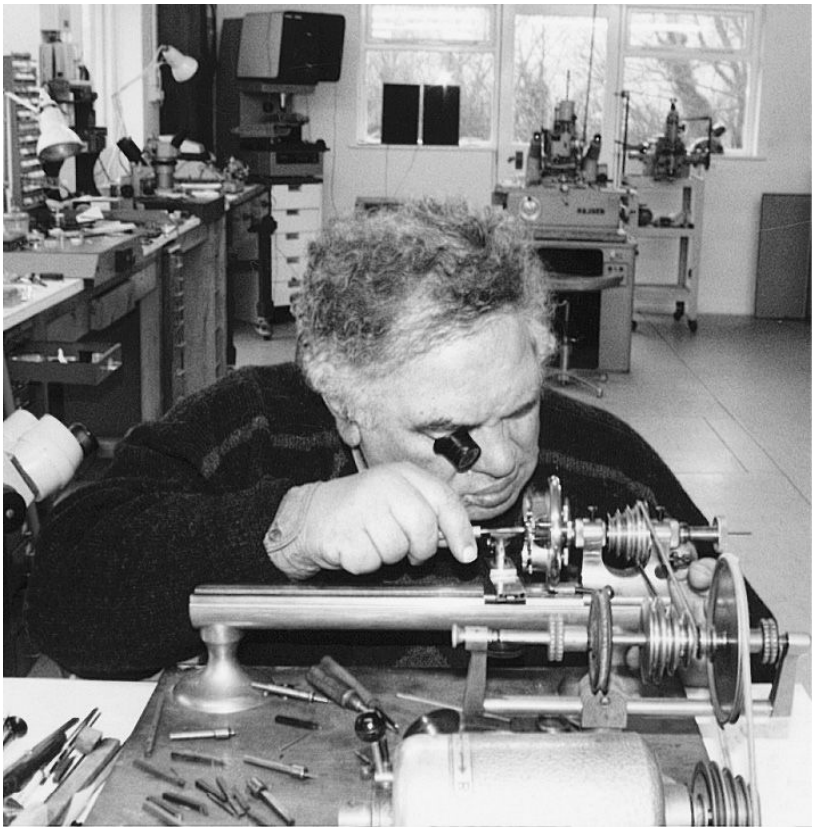
With Derek Pratt at Goldsmith's Hall, where I took him into the Clockmakers' Livery. He is an accomplished technical watchmaker in the true sense – he can make every component of the watch from raw material.

Scott Carpenter, pioneer American astronaut, enthralls Fred Buckhardt, president of the AWI, myself and Henry B. Fried. Carpenter earned the titles of both astronaut and aquanaut, having piloted the American *Aurora* spacecraft on America's second manned space flight, and subsequently spent thirty days living on the ocean floor in sealab ii.

Signing the contract in Swizerland for the industrialisation of the co-axial escapement. A signal moment for me after some 20 years of development work to catch the attention of the Swiss industry. Gillomen is head of R&D at ETA Switzerland.



Derek Pratt – more at home in his own workshop.



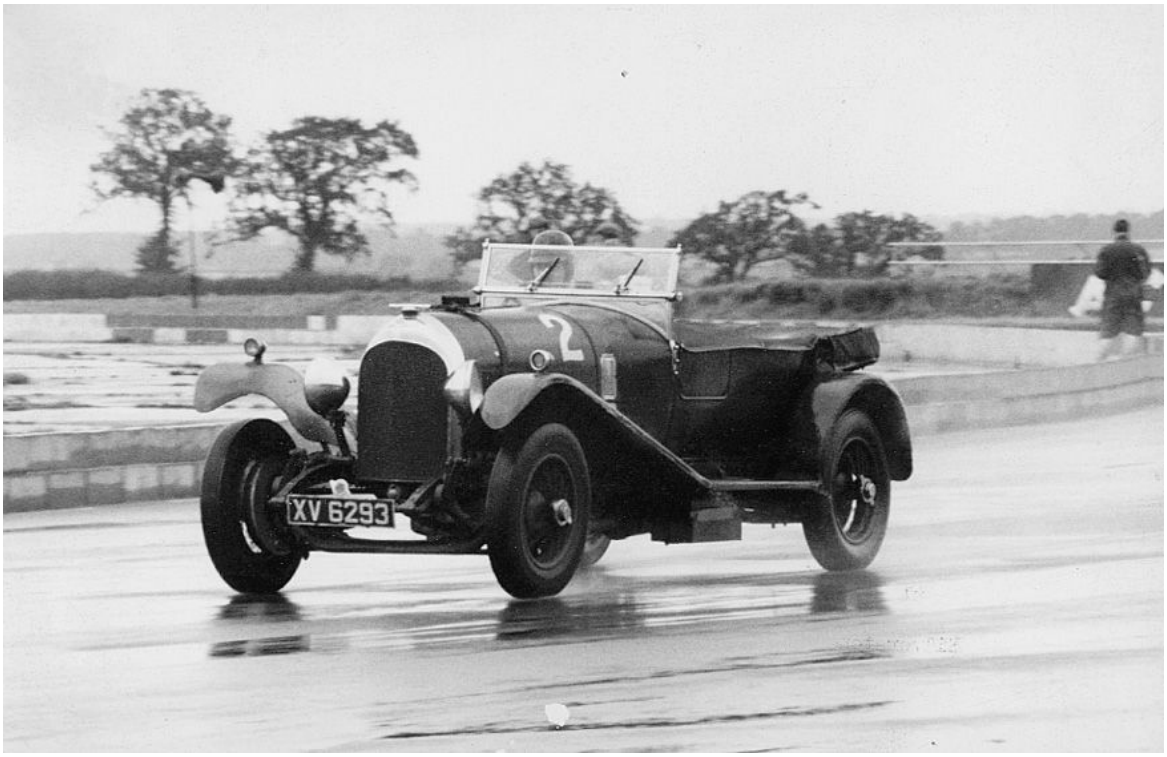
Sir Eduardo Paolozzi tries his hand at watchmaking.

At the dinner: centre, R.V. Jones; right, Derek Goldsmith, industrialist, Andrew Crisford, horologist, myself; left, Derek Pratt, watchmaker, Doug Barden, Goldsmith's pilot.

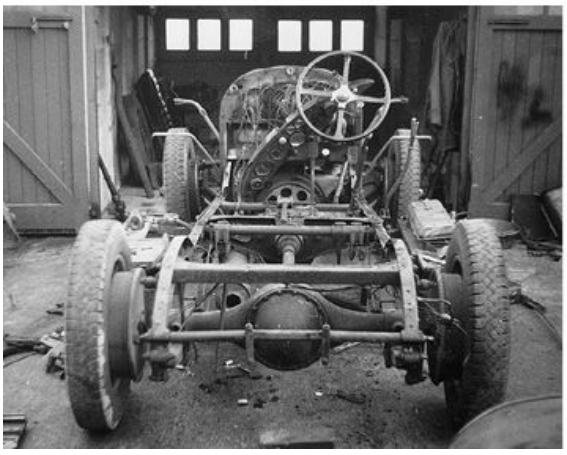
At Goldsmith’s Hall to receive the Tompion Gold Medal from HRH The Duke of Kent.

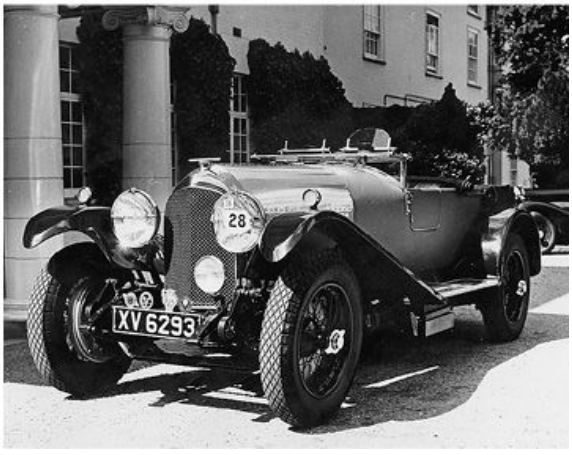
The 16th–century farmhouse in Herefordshire, built of stone and oak.

Receiving the Gold Medal of the City and Guilds, London from Sir Alex Smith, vice-president of the Council and chief scientist at Rolls Royce.



The 3-litre with 4.5-litre engine in its first wet and totally unsuccessful race event at Silverstone.



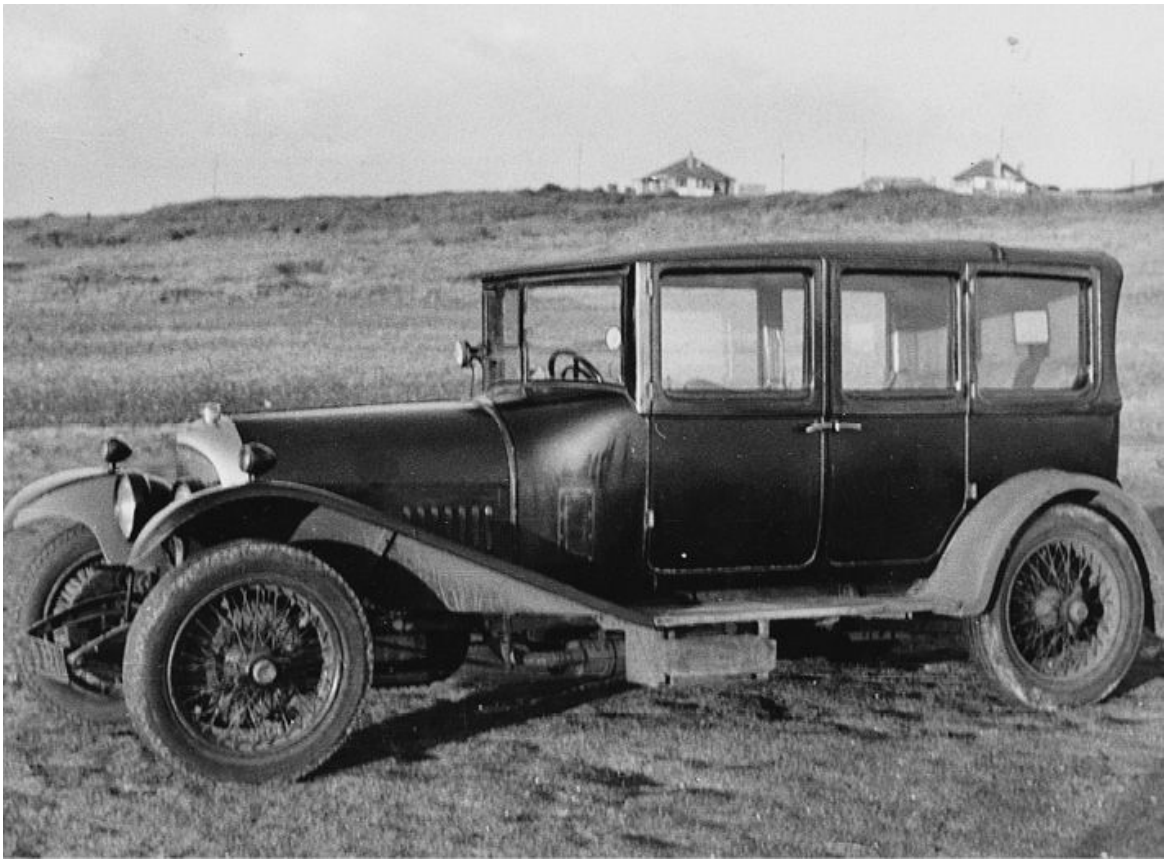


Various stages in the rebuild of my first sports Bentley and the finished result. Note that the garage is too small to allow work on the chassis inside and there is no room for a bench for the engine components. The bottom-right picture shows the car completely rebuilt and ready for the 1959 season.

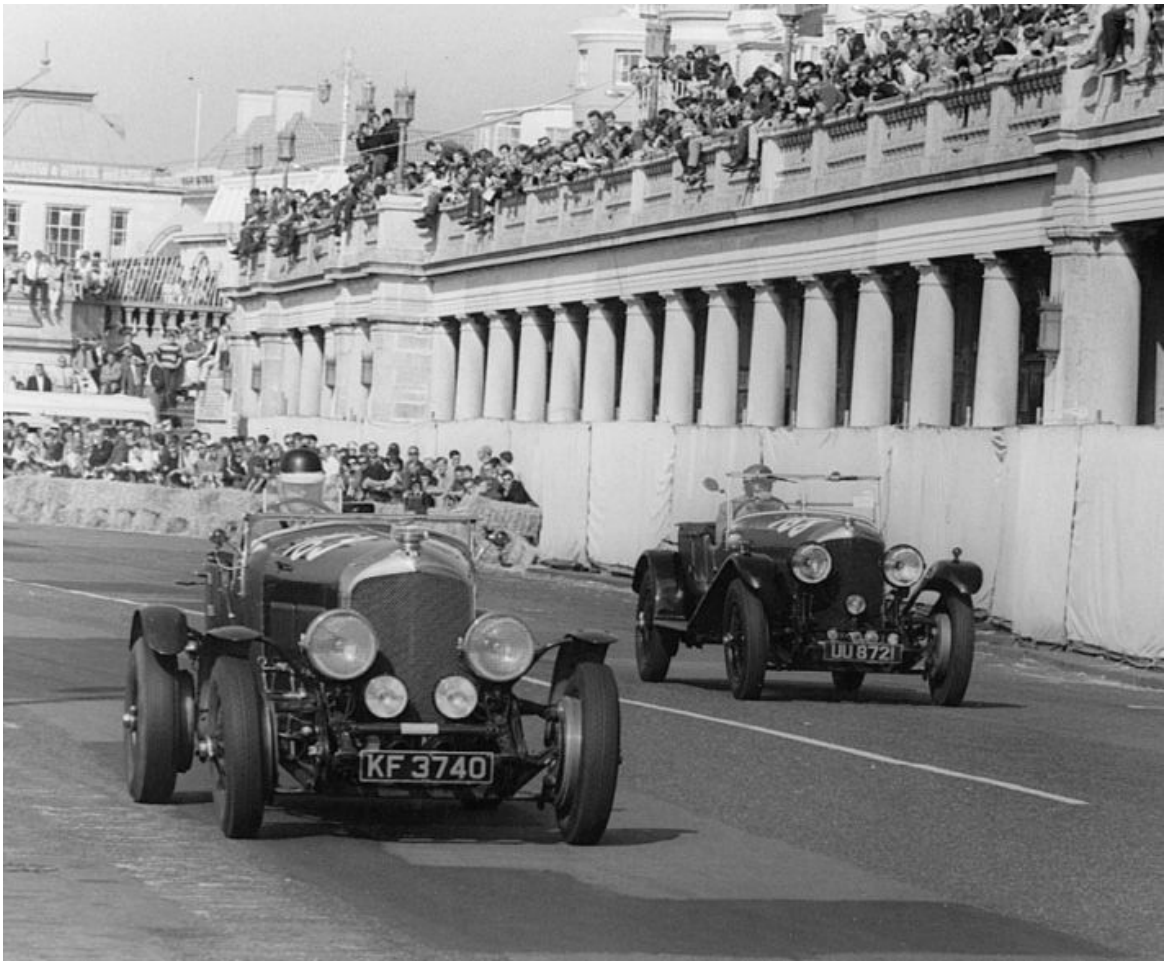
This car was used extensively for racing at Silverstone and rallying in France, Holland and England. In its first race it lost control of itself and took to the grass but facing the right way round to take the chequered flag.

My first race win on the grass at Silverstone.

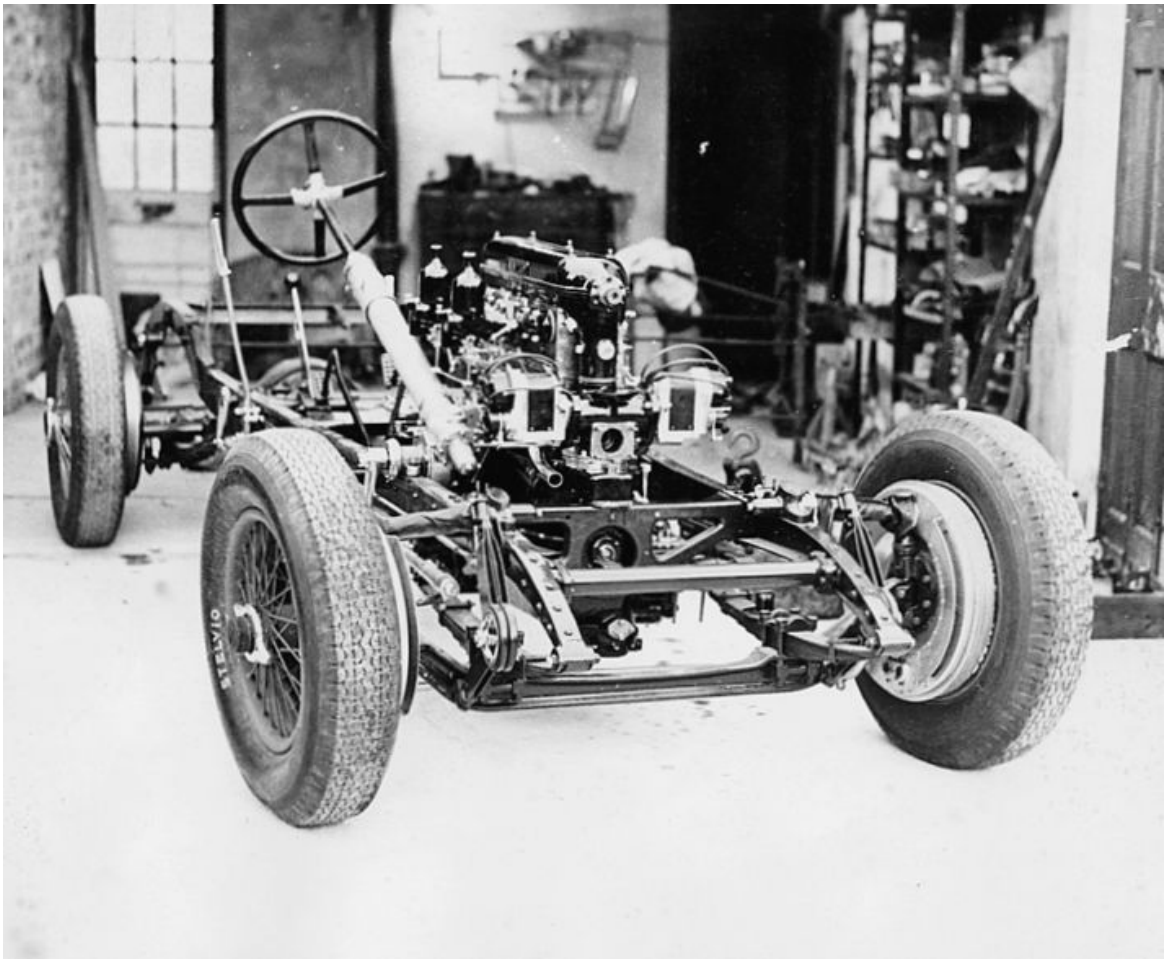
The engine finished to watchmakers’ standards.



PD 3211, 1924 Bentley Landaulette. My first Bentley. As purchased in 1956 for £100.



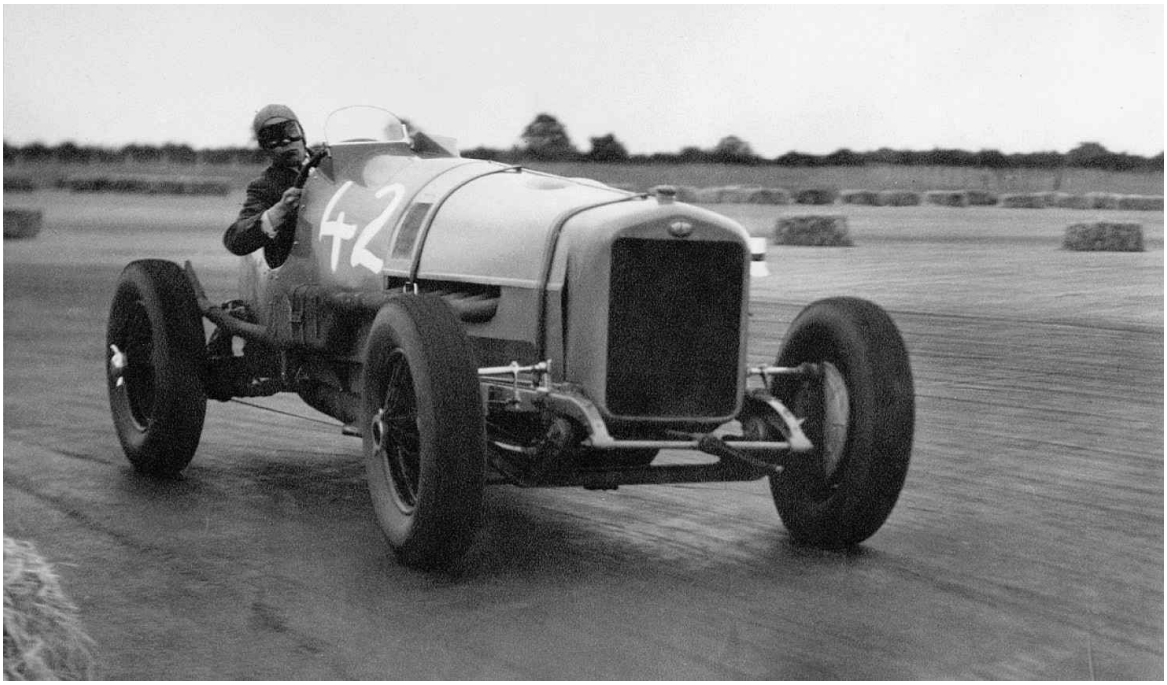
KF 3740. Competing at Brighton Speed Trials in 1965. This car was originally a long-chassis saloon, here converted to short-chassis tourer.



The chassis in process of restoration and ready for the body.

Exhibited at Kensington Gardens Bentley Rally where it was sufficiently unusual to attract attention.

Alas, there was no money for a body, although the chassis was in daily use for some months.



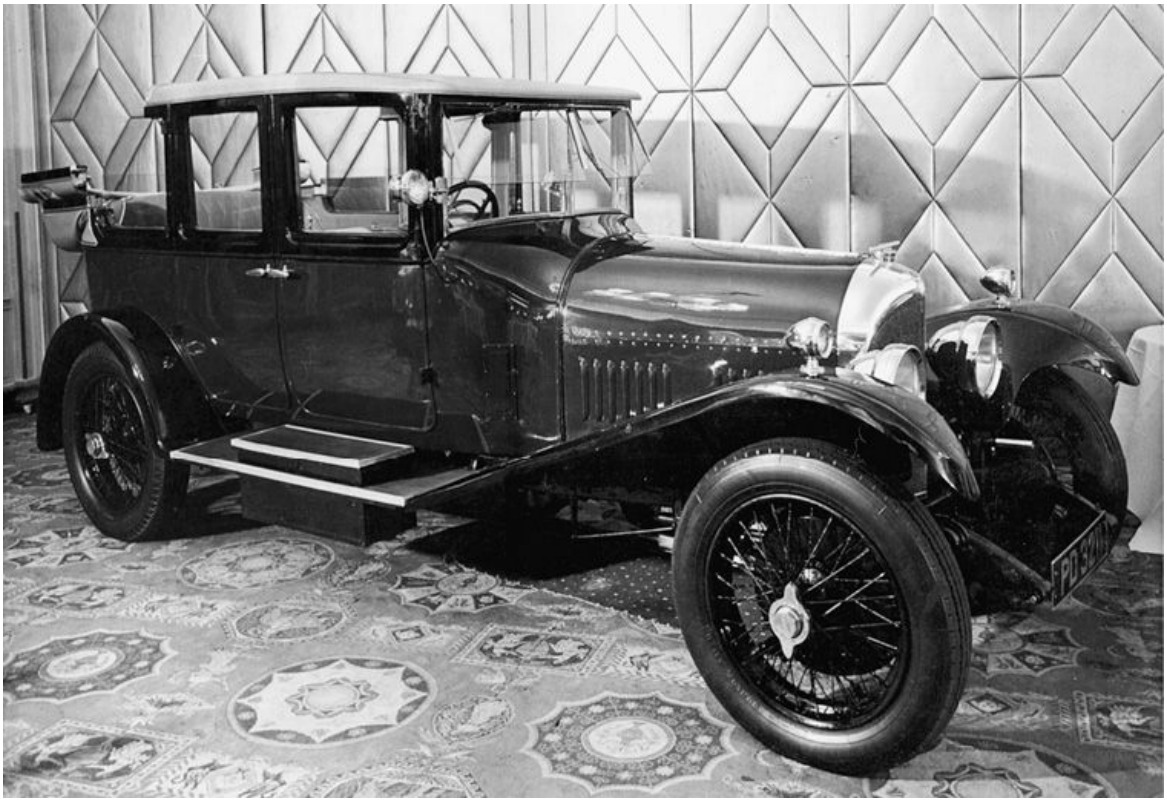
Cecil (Sam) Clutton CBE, Past Master of the Clockmaker's Company, founder member and past President of the Vintage Sports Car Club, Hon. Fellow of the Society of Organists, author, aviator, motorist extraordinaire and motorcyclist, at speed in his 1924 Land Speed record V 12 Delage.

The 1907 Daimler in Scotland with Prof. Reg Jones and his wife Vera, to the right Derek Pratt and to the left Andrew Crisford. We had driven up from the Isle of Man for a party, with music supplied by two pipers and Reg and myself on mouthorgans. This is a primitive car of 10.6 litres' capacity, capable of 80mph with only the sketchiest brakes so that the driver must look a long way ahead. Any inconvenience is partly compensated by five separate means of audible warning of approach.

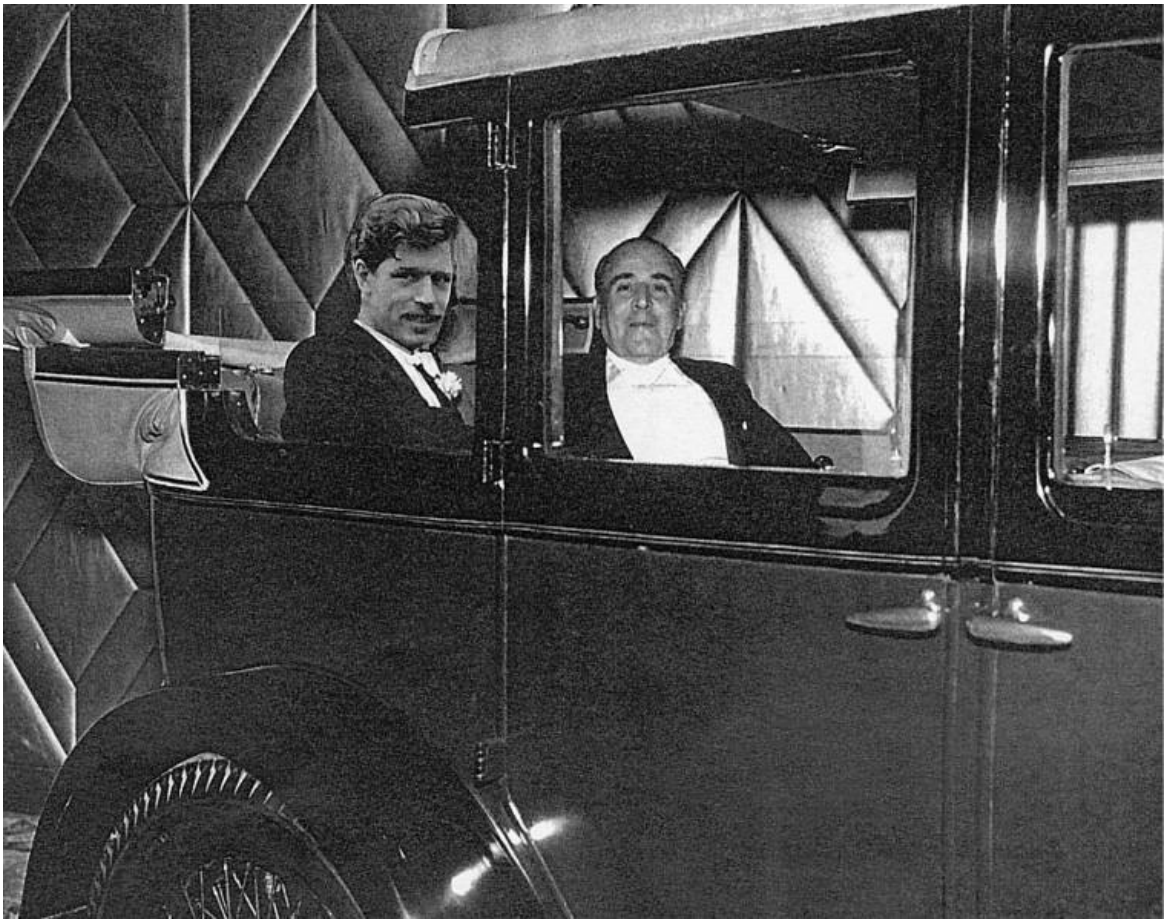
The view from the driver’s seat of the Daimler.

With Derek Pratt, at speed in the Daimler in Scotland.

The car can reach 80mph.



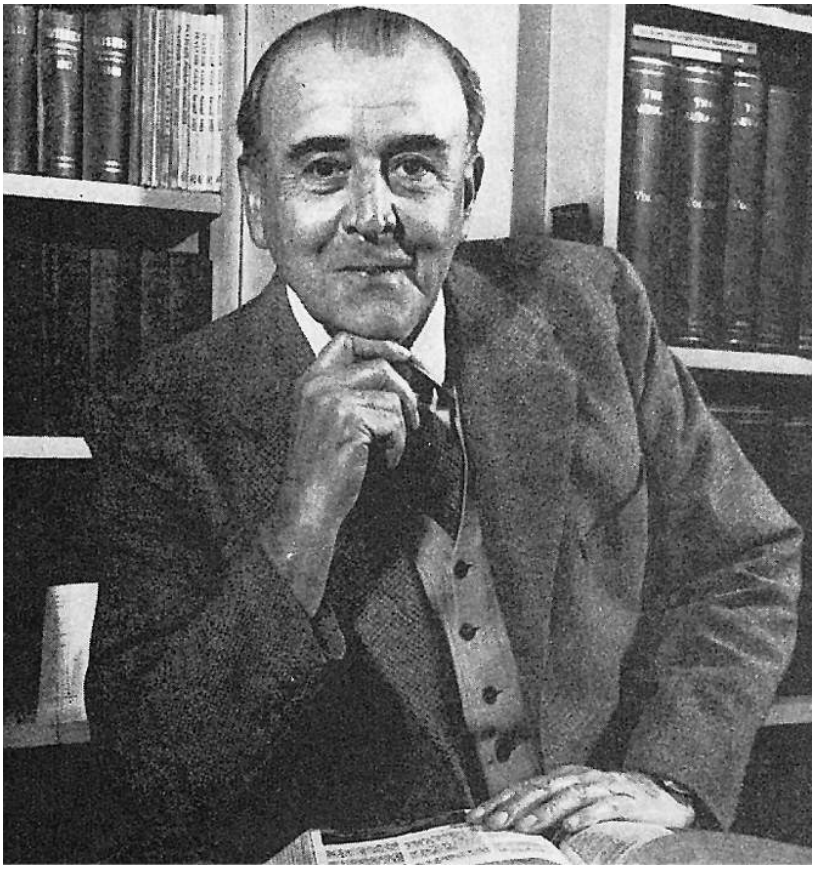
The 3-litre Bentley with Gurney Nutting landaulette coachwork, completely restored, and champion of the Kensington Gardens Bentley *concours d'elegance*, on display in the ballroom of the Dorchester Hotel in London during the BDC 1960 dinner dance.



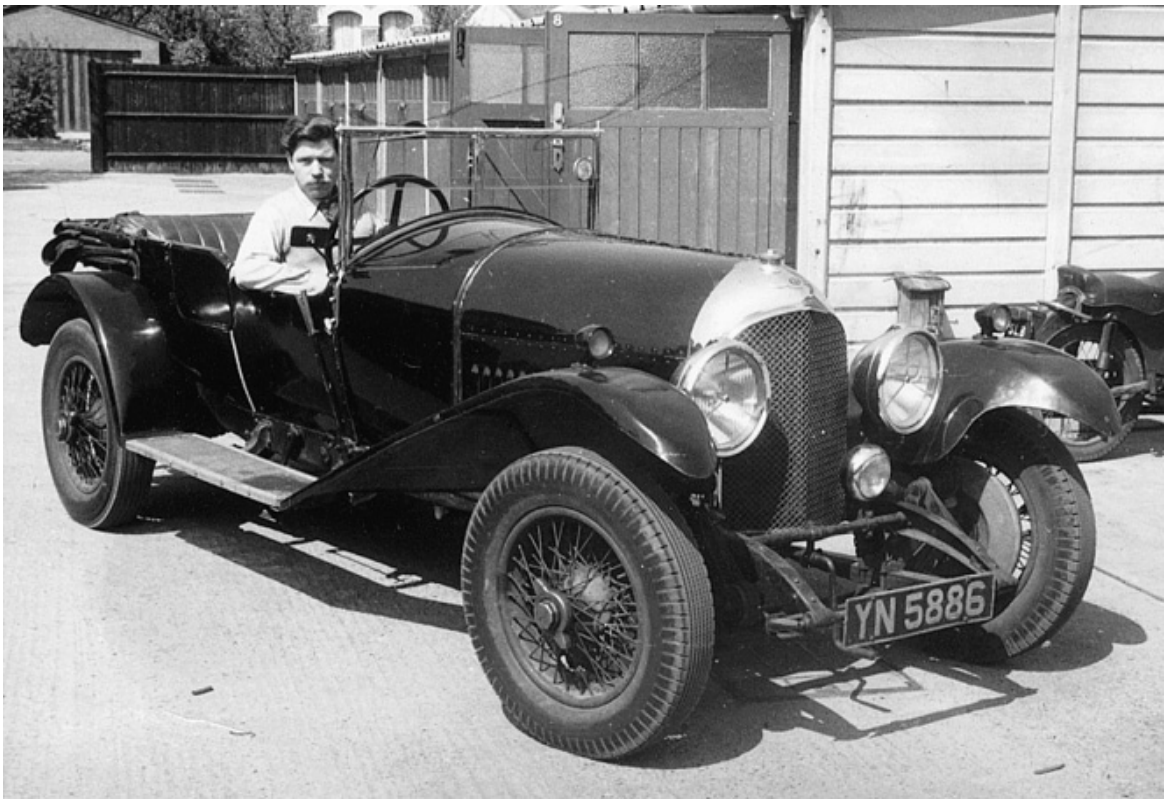
With the great man himself W.O. Bentley in the landaulette at the Dorchester.

1959, on the Brighton Run with Lou Holland in the *c*.1898 English Mechanic. Lou claimed to be a gypsy. He was an opportunist dealer, totter, car and motorcycle fancier and brilliant accordionist, from whom I took lessons. I specially prepared the car so that it could complete its first ever Brighton Run. It was necessary for me to dismount and push both it and Lou up every incline!

1992, C.J. (Joe) Turner, who raced the Bentley YU 3250 in 1932. He won three races at Brooklands and a coveted 120mph gold badge.



Walter Owen Bentley, 1888–1971, whose magnificent cars upheld the engineering honour of England during the 1920s by the numerous racing successes including winning 5 times the 24-hour endurance race at Le Mans.



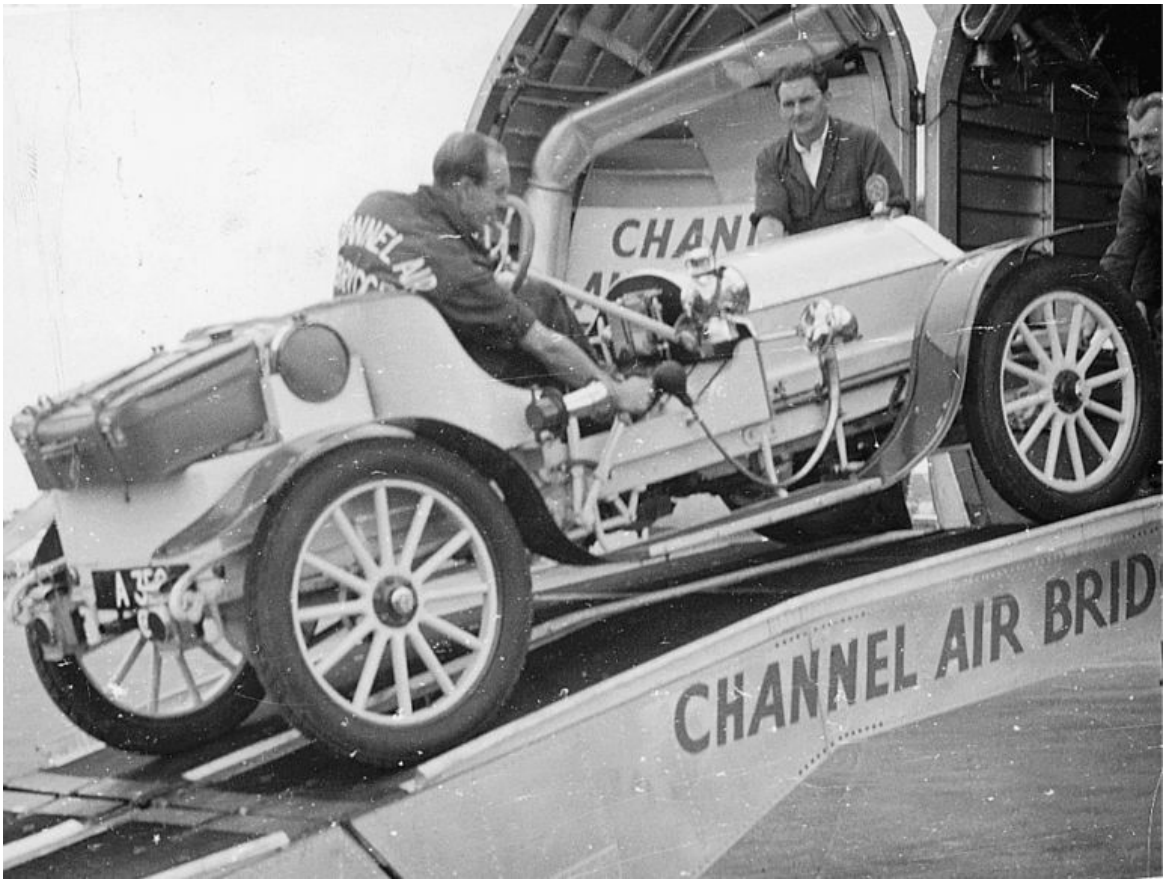
Vanden Plas-bodied 3-litre Bentley YN 5886, one of four Bentleys stripped and rebuilt in the eight-foot-wide garage behind the flat in South Norwood.

1962 TR3A running in the Pomeroy Trophy at Silverstone, 1963. This excellent car was specially tuned by the works to do 100mph, but eventually the crankshaft broke.

Robert’s yacht Larne, undergoing trials in the Channel.

A rough sea in Biscay aboard a fishing trawler searching for our stolen yacht.

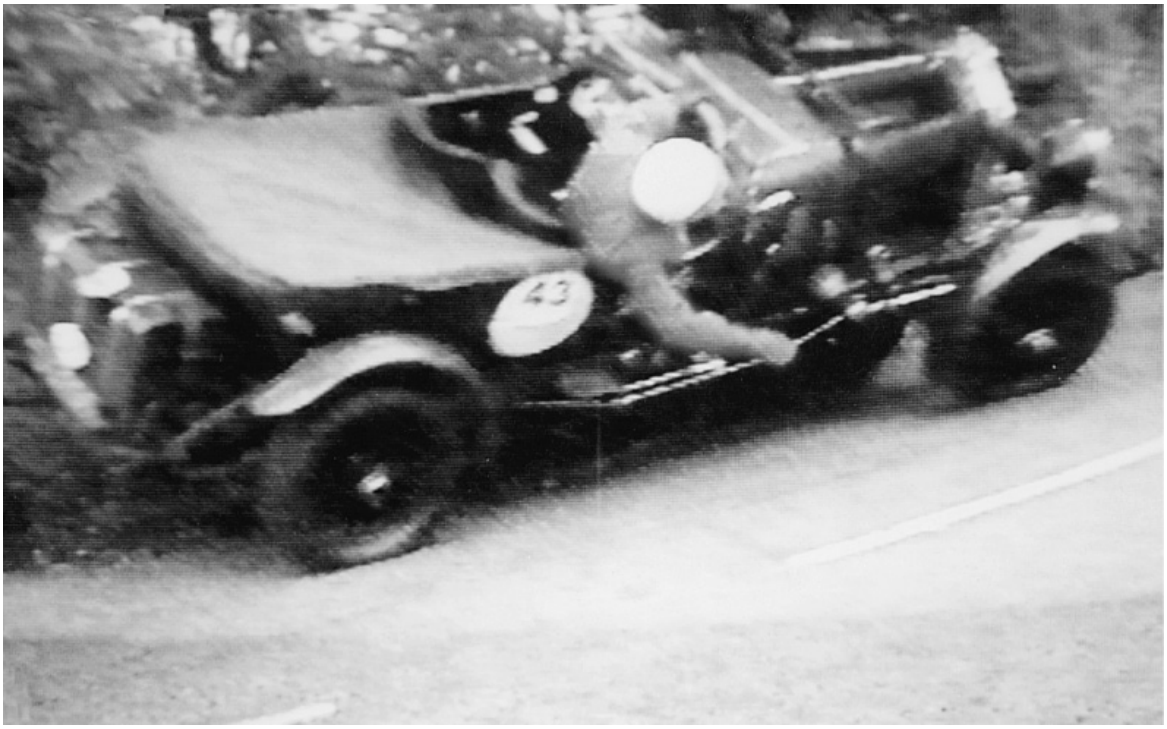
The 17th-century Yorkshire house in typical winter ‘writing’ weather.



1908 Single-cylinder De Dion-engined Jackson being loaded in 1959 onto a Bristo Freighter at Southend for the flight to Belgium, from where we drove to Utrecht in Holland. The Jackson had a maximum speed of 40mph and would cruise at 35mph. Its single-cylinder engine caused the most intense vibration so that lamp brackets were continually breaking, but I covered thousands of enjoyable miles in, or rather, on it.

1972 E Type 4.2 six–cylinder, competing in the Pomeroy Trophy at Silverstone. It was described by a spectator as looking thoroughly dangerous. It certainly had a strong desire to go sideways when cornering and eventually ran out of brakes.

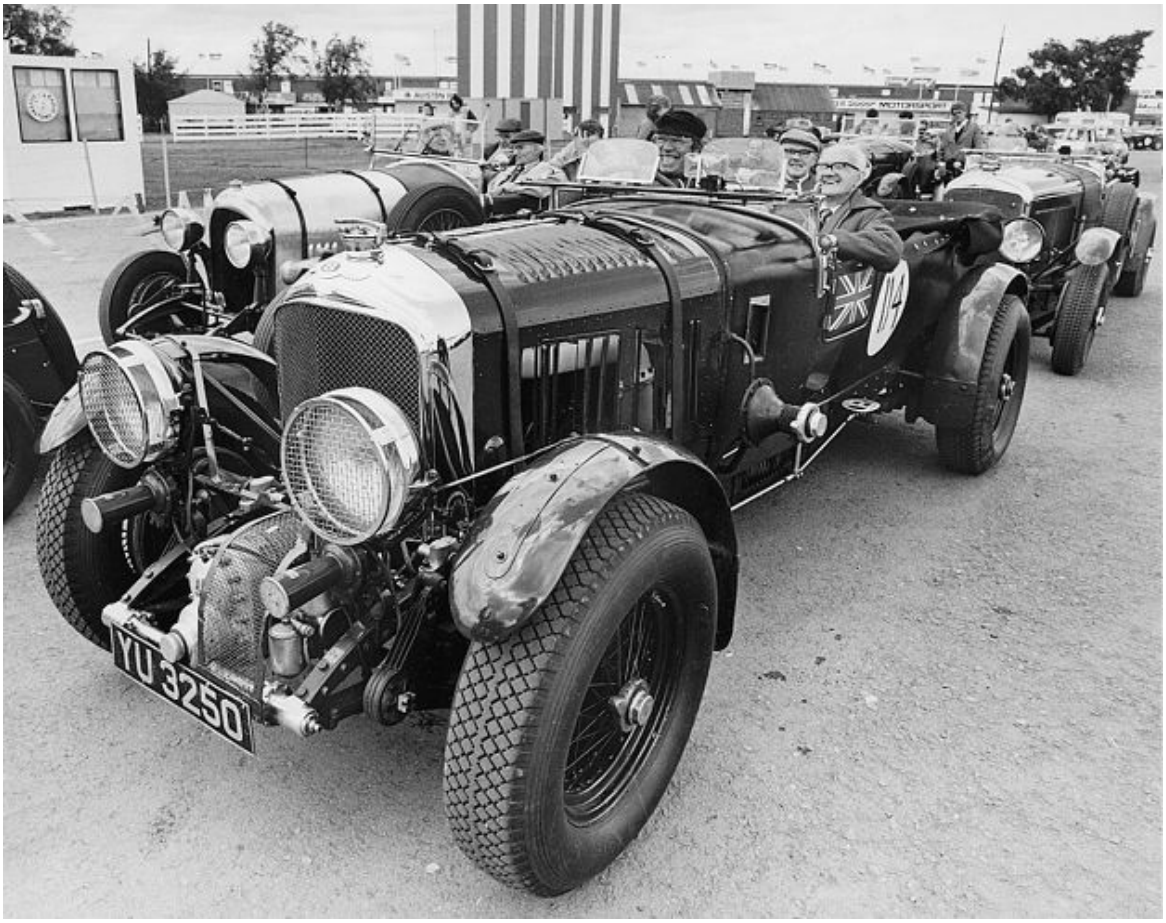
YU 3250 on the starting ramp for the 1990 Mille Miglia retrospective event. The knowledgeable enthusiast will find Juan Fangio among the onlookers. It is a most colourful and exciting event with a thousand miles of unrestricted driving through Italy.



1995 Manx Racing Car Club TT YU 3250 attempts to throw me out and head for the country! Some amused spectators thought I was trying to stop the car rolling with one hand. In fact I was trying to prevent myself being thrown out.

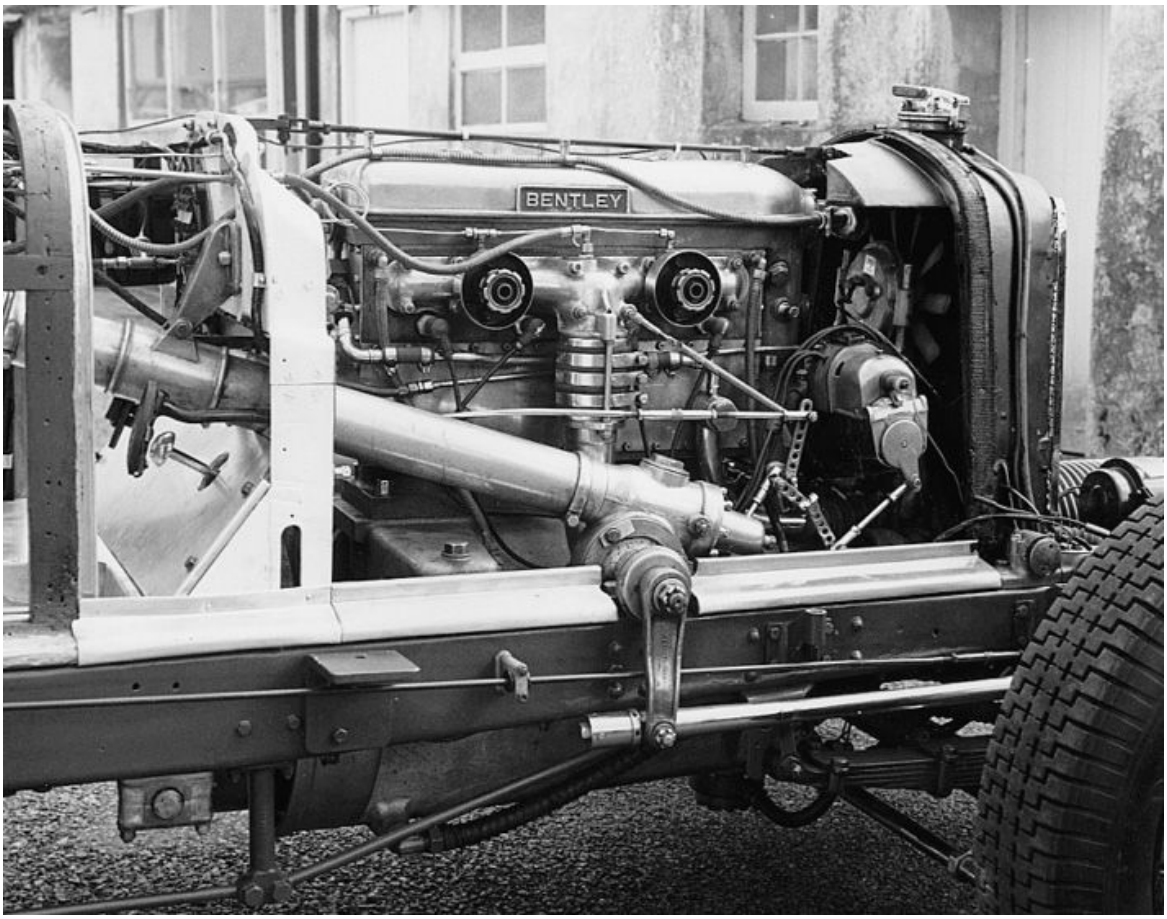
MN 3740, now converted to supercharged Le Mans replica and running in the Manx Racing Car Club's Sloc Hill climb.

Prince Michael of Kent, a keen sporting motorist, drives YU 3250 in an Isle of Man rally.



YU 3250, the first experimental Bentley Blower with Billy Rockell occupying the passenger seat in his traditional role as mechanic to Birkin's team.

Experiencing W.O. Bentley's 1922 Isle of Man TT car at Jurby race track on a wet day. A team of three such cars took the team prize in the event.

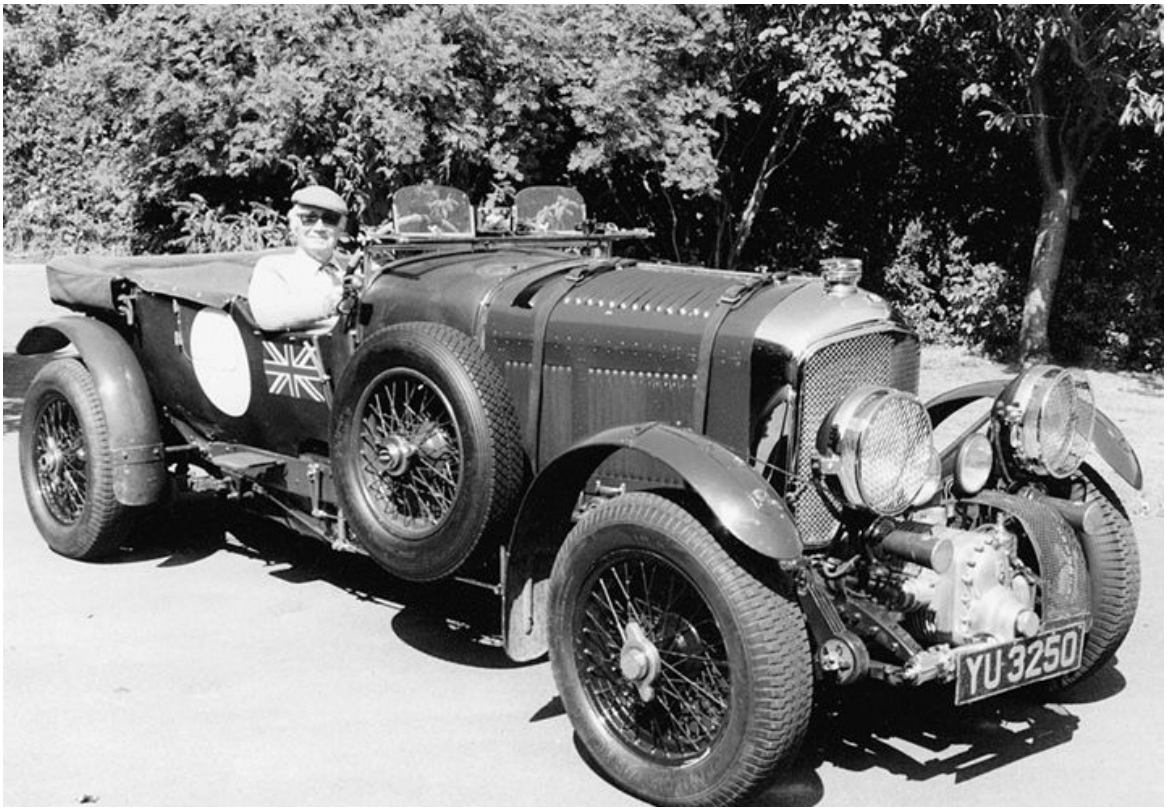


The restoration of the chassis and body of the single-seater.

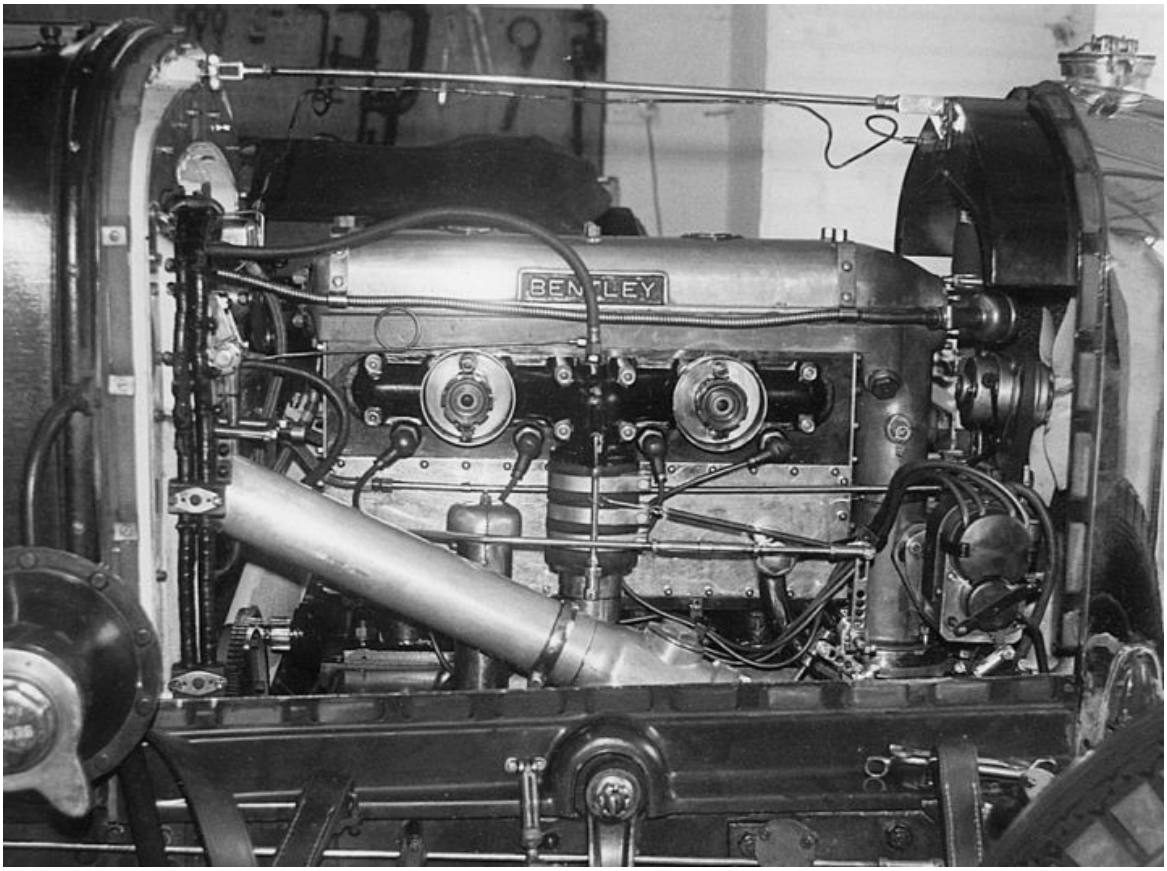
The engine restored and reinstalled.

Back in action at a wet Oulton Park.

Tim Birkin's Bentley and John Cobb's Delage, with owner Jonty Williamson, together again, after 56 years, in the paddock at Prescott Hill Climb, 1988.



Geoffrey Quill in YU 3250. As a test pilot, Geoffrey flew the first Spitfire in 1936 and tested and flight-developed every subsequent model of the plane. His last flight was in 1966, after 30 years of Spitfires including flying as a Battle of Britain pilot.



The engine of YU 3250 restored, ready for hard work.

The Birkin, single-seater track car. Birkin in the white helmet with his mechanic, Billy Rockell, in white overalls, working on the engine. Frank Clement, smoking a cigarette, was Bentley's works driver and development engineer.

The flamboyant Amhurst Villiers at Kensington Gardens Bentley Rally. Birkin's team of four Bentleys were supercharged by Amhurst, and his record lap of 137.96mph was achieved with a Villiers supercharger.

Receiving the award for the fastest lap in the Bentley–Mercedes challenge at Nurbergring.

The single-seater is too long and too heavy for tight bends. By going into the bend fast, slamming on full lock and opening the throttle the back will come round to bring the car facing in the required direction.

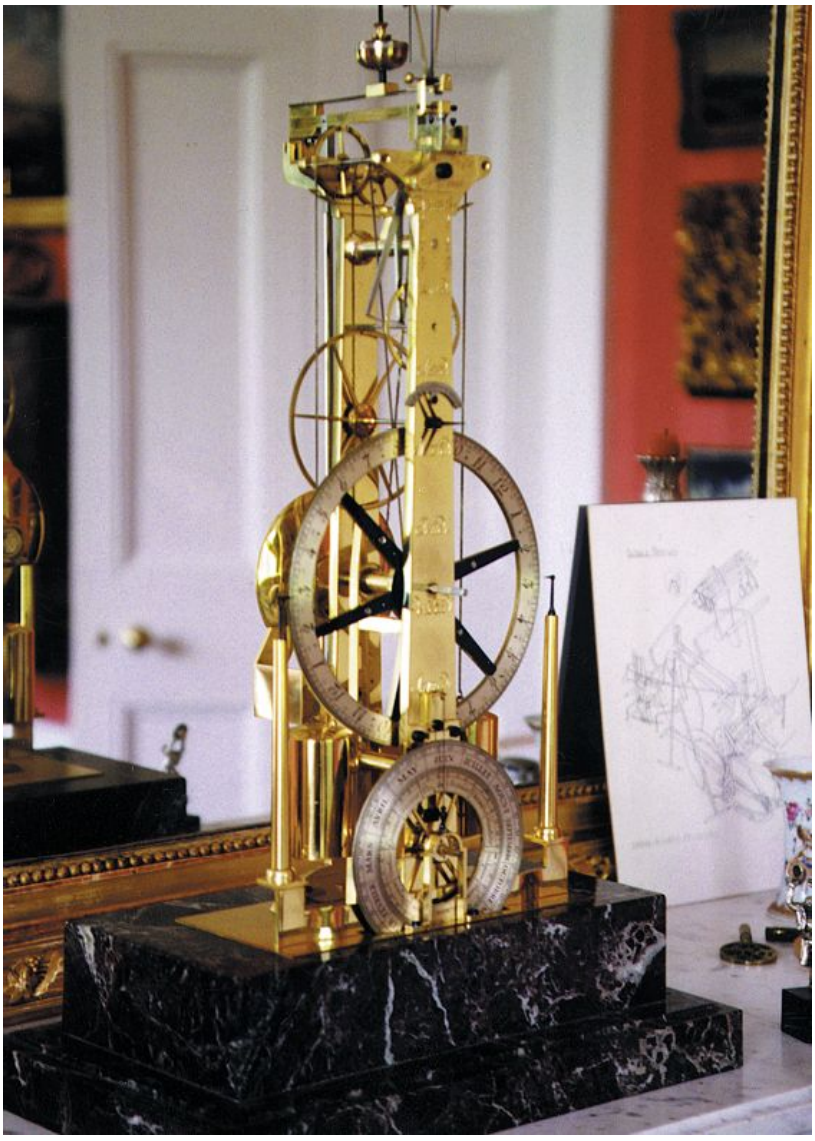
Master of the Worshipful Company of Clockmakers, 1980

Professor R.V. (Reg) Jones CH, CBE, FRS, wartime scientific adviser to Churchill when he broke the German bombing beams. Numbered among his accomplishments: a gift for playing the mouthorgan. Here we play together at a private party given to celebrate the Queen's gift of Companion of Honour.

The IOM Millennium Stamps, printed to my chosen theme and technical design depicting the British invention and development of the precision timekeeper. The work of Harrison, Mudge, Arnold and Earnshaw is illustrated, and concludes with the co-axial escapement.

With astronaut Eugene Cernan on the moon buggy at the Basel launch of the co-axial escapement.

Typical Bentley Drivers Club Silverstone grid.



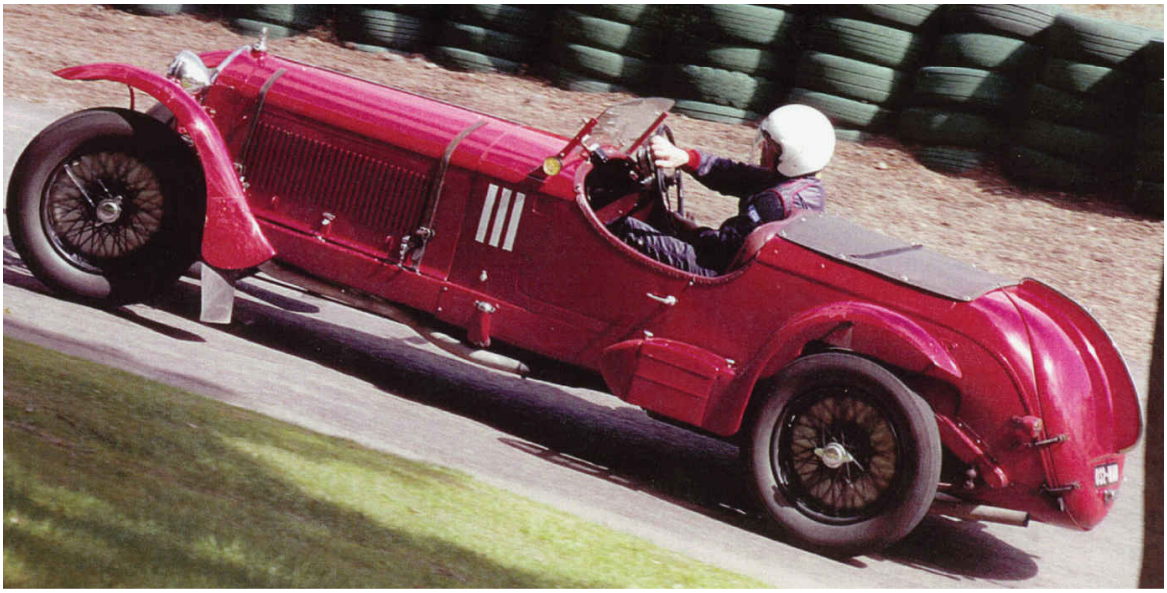
Breguet 3-wheel clock made when agent for Breguet in 1968.

The rebuilt Alfa in its first competitive event in the Manx Classic. In four events it gained two firsts in class and one second.

4.5-litre Bentley purchased in 1929 by the Maharajah of Blevanagar.

Richard Noble, builder of the fastest car on earth, inspects the Birkin single-seater and the Birkin/Howe 1932 Le Mans Alfa Romeo.

The beautiful 1953 R Type Continental Saloon in my possession for 26 years and with thousands of tranquil miles to its credit.

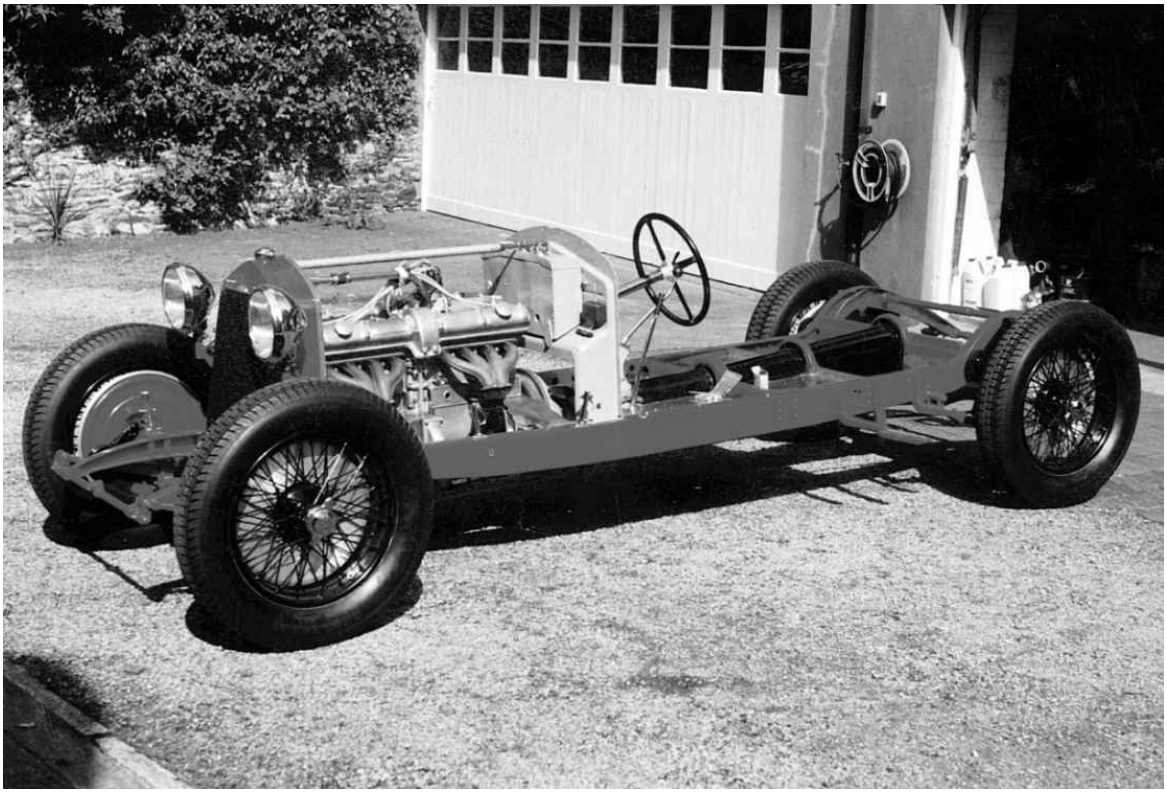


1932 8-litre Alfa Romeo driven by Birkin and Howe at Le Mans, and again by Howe in the Ards TT with a class win at record speed. Cars of this type are ideal for club competition events.

The completed lock-up garages within the huge barn.

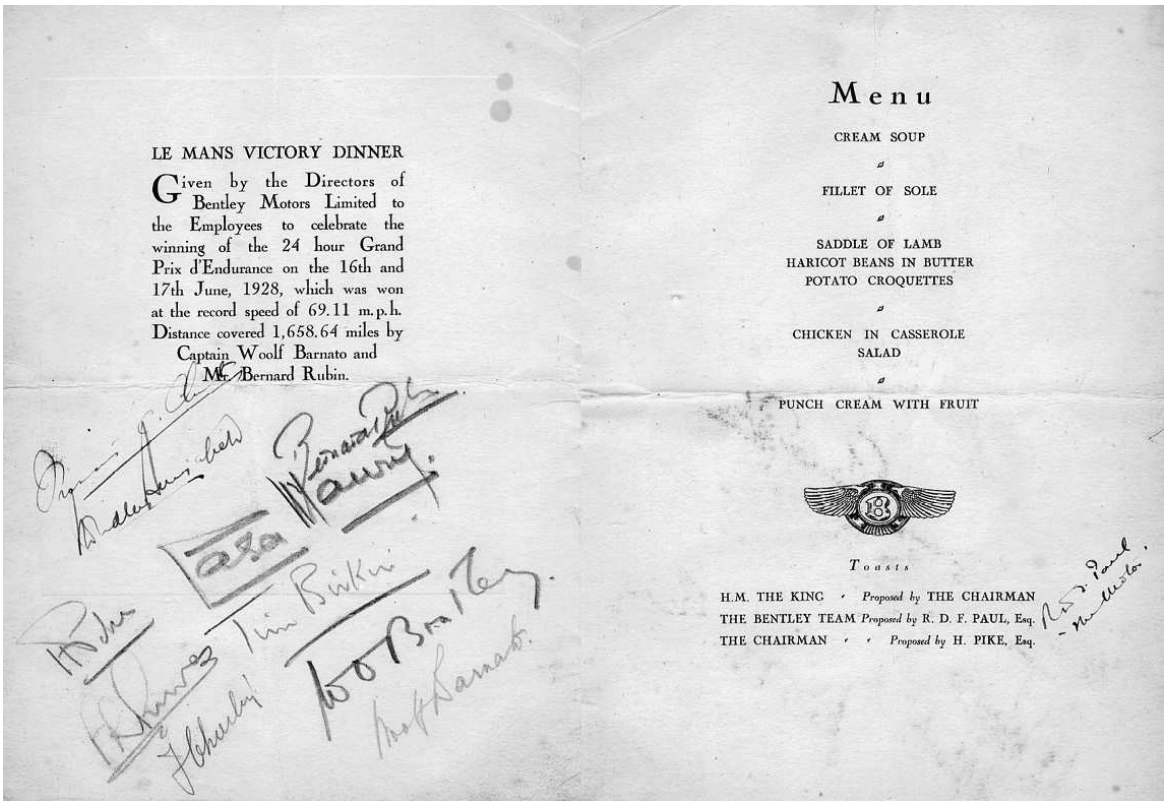
The Birkin single-seater enjoying its exercise in a Vintage Sports-Car Club event at Silverstone.

The frame of the Alfa stripped, repaired and ready for rebuilding.



The chassis completed, ready for fitting the body.

The completed car competing in the 1999 Manx Classic.



LE MANS VICTORY DINNER

Given by the Directors of Bentley Motors Limited to the Employees to celebrate the winning of the 24 hour Grand Prix d'Endurance on the 16th and 17th June, 1928, which was won at the record speed of 69.11 m.p.h. Distance covered 1,658.64 miles by Captain Woolf Barnato and Mr. Bernard Rubin.

Menu

CREAM SOUP

FILLET OF SOLE

SADDLE OF LAMB
HARICOT BEANS IN BUTTER
POTATO CROQUETTES

CHICKEN IN CASSEROLE
SALAD

PUNCH CREAM WITH FRUIT

Toasts

H.M. THE KING . . *Proposed by* THE CHAIRMAN
THE BENTLEY TEAM *Proposed by* R. D. F. PAUL, Esq.
THE CHAIRMAN . . *Proposed by* H. PIKE, Esq.

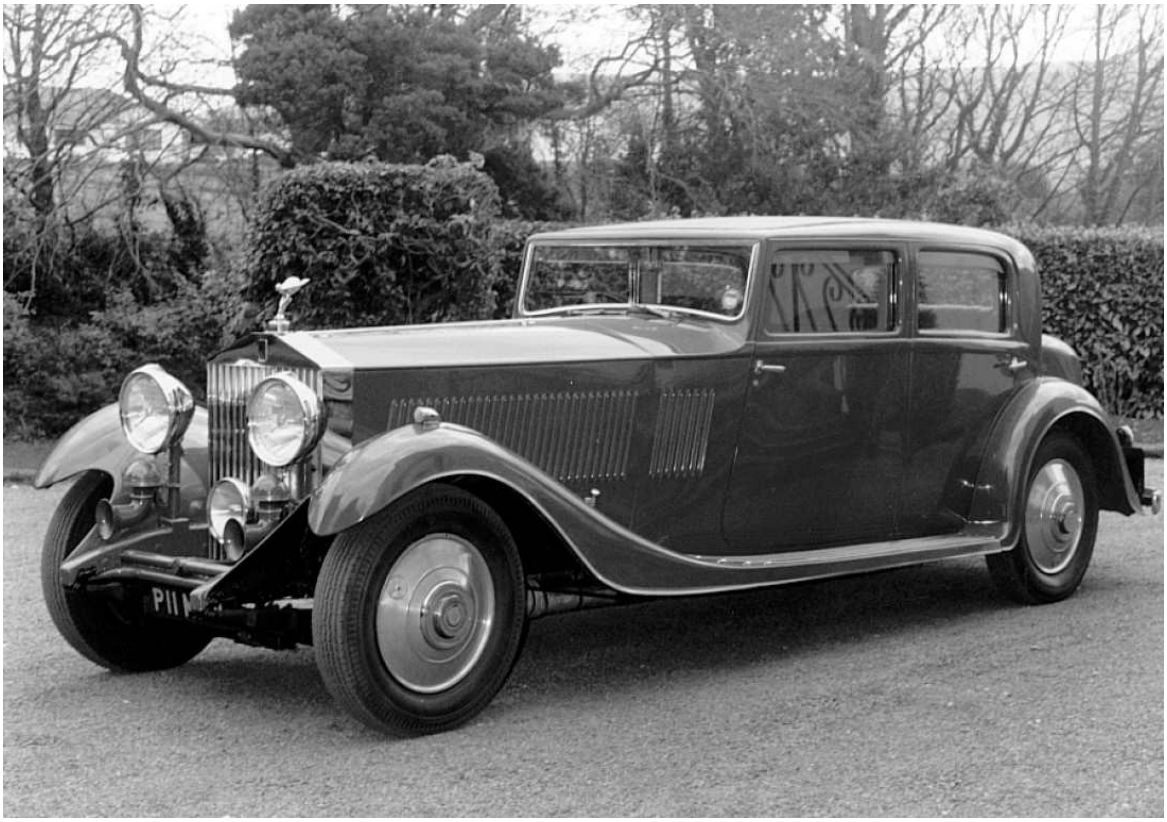
The victory celebration menu for the 1928 Le Mans race.

A rare privilege in being allowed to drive Roger Collings' Mercedes 60, his daughter in the passenger seat and her husband, nobly push-starting. This is one of the great cars of motoring history. They are rare, fast and exciting – the very essence of primitive motoring for sporting purposes.

Prince Michael of Kent, a keen motorist, talks Bentleys to Dr Brian Hamilton at Brooklands Club House.

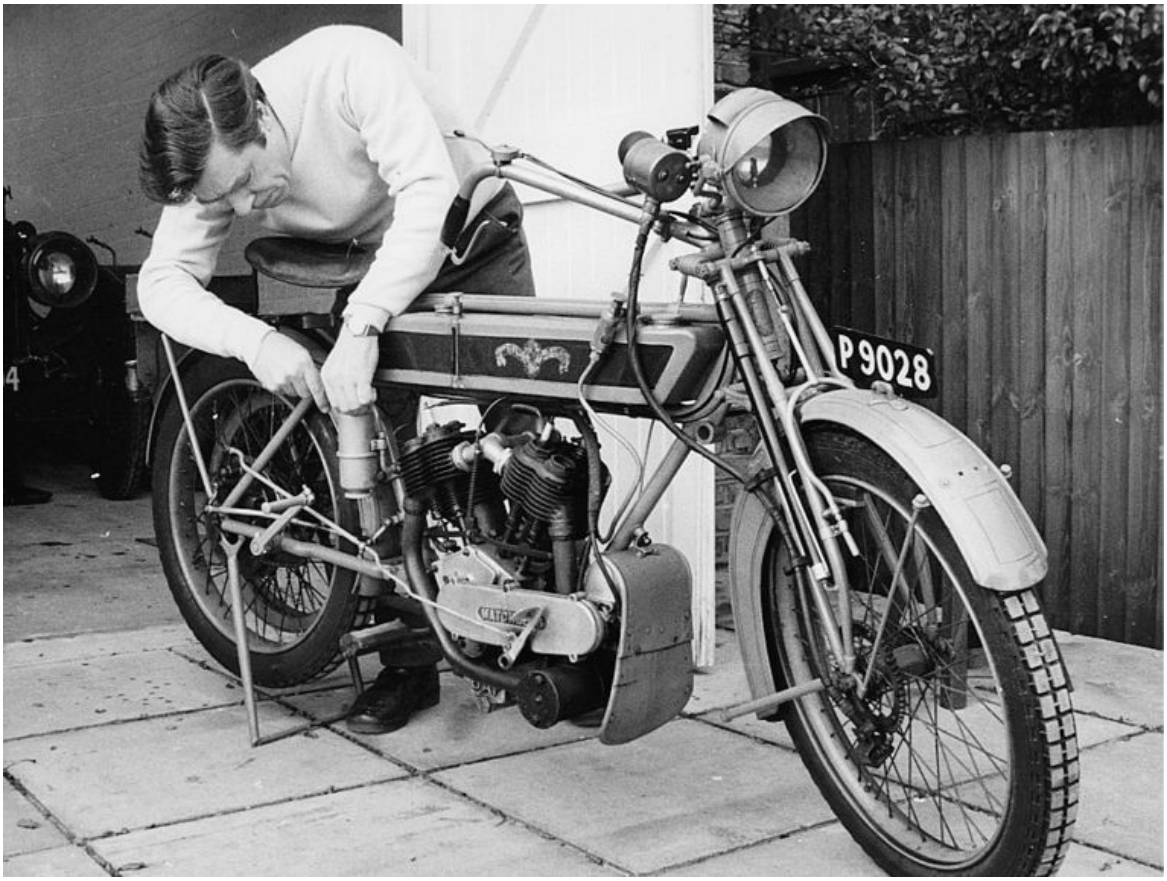
1950 Sunbeam, bought in 1970 with 200 miles on the clock.

To Sotheby’s on the BMW 90S. The motorcycle was the quickest and most convenient means of transport from South Norwood to Bond Street.



1934 Phantom II Rolls-Royce, I bought this car on impulse at a Sotheby's auction solely on its appearance. It was both elegant in appearance and, apparently, fully restored. It proved to be heavy to drive, claustrophobic, tiring, and very noisy if driven above 50mph, at which speed it did 8 miles to the gallon. Overhauling the engine made little difference to the noise level and so it was sold to a man who has never found cause to complain about it!

1974 V12 Jaguar E Type. These cars are the last of a line of sports cars conceived by Sir William Lyons and his aerodynamicist Malcolme Sayers. They are smooth, silent, comfortable, quick, and individual enough to require careful monitoring at high speeds.



Topping up the acetylene-gas generator prior to a run on the 1910 V Twin Matchless. This machine, being devoid of directional stability and brakes, needed great concentration if a wobble was to be avoided. With a following wind it could reach 60mph with its near silent side valve 750cc engine.

1949 Clubmans International Norton 500cc model.

The Isle of Man becomes a mecca for motorcyclists during TT week in June each year. Thousands arrive to spend the time driving about the Island, and to try their machines over the TT course. It is a remarkable festival of motorcycling with every visitor well behaved and a credit to the sport.

MV Agusta 750cc four-cylinder, twin overhead camshafts. Rather too heavy and inclined not to change direction unless manhandled. These Italian machines have an enviable record of international race wins and championship titles.

1975 BMW used for journeys from the Isle of Man to London and back.

The watch seen in Plate 28 is the first watch made in the new Daniels London workshops built in south-east London in 1970. It is fully discussed in pages 91–96. Its success prompted the construction of seven more examples, each containing the benefit of the development of its predecessor. The differences in the completed watches were very small and principally directed to improving the geometry of the escapement. Such minute changes will have an effect on the impact of the engaging components, and this in turn will effect the timekeeping of the watch.

With the first few watches completed it was found that the timekeeping varied with change of room temperature. Normally, in production watches, the hairspring is matched to the balance wheel. For these early watches, small bimetallic correctors were fixed to the balances to compensate for the error.

The form of the balance pivots and the balance jewels was the subject of much experimenting to eliminate changes of rate for change of position of the watch. The results of the experiments, where beneficial, were built into later watches.

The final experiment with the *tourbillons* was the addition of a remontoir spring to eliminate variations in balance amplitude. This watch, Plate 36, when rigorously tested horizontally over several weeks, showed no variation of daily rate but it was time to turn to more original conceptions.

I had learned from and enjoyed experimenting with the *tourbillons*, but I knew a better escapement was needed and my thoughts turned to more advanced ideas for the future as seen in the plates following.

All watch images in the following colour section courtesy of Sotheby's.

Bronze bust by Sir Eduardo Paolozzi (1924–2005) 1997

George Daniels CBE, DSC, FSA, FCGI, FBHI, FAWI

The second Space Traveller’s watch

One of the two Breguet three-wheel skeleton clocks

A Daniels' Grasshopper escapement fitted to a 19th-century domestic regulation

George Daniels’ first horological exercise; the Thomas Mercer Marine Chronometer

THE FIRST DANIELS WATCH: A GOLD AND SILVER ONE-MINUTE PIVOTED-DETENT CHRONOMETER TOURBILLON

Gilt brass construction with two going-barrels engaging a common, offset centre-pinion. 36-hour duration, with pivoted-detent chronoment escapement mounted in a steel one-minute *tourbillon* carriage under a brass balance cock. Monometallic, stainless-steel, four-arm balance with gold adjusting weights. Overcoil balance spring with isochronal adjusting screw. Retrograde hour-hand mechanism. Silver engine-turned dial with polished minutes chapter ring and quadrant for the retrograde hour hand. Large interlaced seconds ring with cartouches either side. 18K gold and silver engine-turned case. 62mm diameter. Signed Geo. Daniels, London, cc.

A GOLD ONE-MINUTE SPRING-DETENT CHRONOMETER TOURBILLON

Gilt brass construction with two going-barrels engaging a common, offset centre-pinion. 36-hour duration. Earnshaw's spring-detent chronometer escapement mounted in a steel one-minute *tourbillon* carriage under a steel balance cock. Monometallic, stainless-steel, four-arm balance with gold adjusting weights. Overcoil balance spring with isochronal adjusting screw. Retrograde hour-hand mechanism. Silver engine-turned dial with polished minutes chapter ring and quadrant for the retrograde hour hand. Large interlaced seconds ring with cartouches either side, signed Daniels and London. Blued-steel Daniels hands. 18K gold engine-turned open-face case with Daniels pendant and bow. 62mm diameter. Signed Geo. Daniels, London, ram.

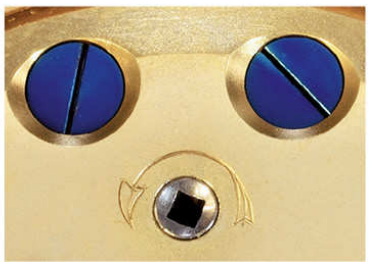
A GOLD ONE-MINUTE SPRING-DETENT CHRONOMETER TOURBILLON

Gilt brass construction with two going-barrels engaging a common, offset centre-pinion. 36-hour duration. Earnshaw's spring-detent chronometer escapement mounted in a steel one-minute *tourbillon* carriage under a steel bridge. Monometallic, stainless-steel, four-arm balance with gold adjusting weights. Overcoil balance spring with isochronal adjusting

screw. Retrograde hour-hand mechanism. Silver engine-turned dial with polished minutes chapter ring and quadrant for the retrograde hour hand. Large interlaced seconds ring with cartouches either side, signed Daniels and London. Blued-steel Daniels hands. 18K gold engine-turned open-face case with Daniels pendant and bow. 62mm diameter. Signed Geo. Daniels, London, sb.

A GOLD ONE-MINUTE SPRING-DETENT CHRONOMETER TOURBILLON

Gilt brass construction with two going-barrels engaging a common, offset centre-pinion. 36-hour duration. Earnshaw's spring-detent chronometer escapement mounted in a steel one-minute *tourbillon* carriage under a steel bridge. Monometallic, stainless-steel, four-arm balance with gold adjusting weights. Overcoil balance spring with isochronal adjusting screw. Retrograde hour hand mechanism. Silver engine-turned dial with polished minutes chapter ring and quadrant for the retrograde hour hand. Large interlaced seconds ring with cartouches either side, signed Daniels and London. Blued-steel Daniels hands. 18K gold engine-turned open-face case with Daniels pendant and bow. 62mm diameter. Signed Geo. Daniels, London, emh.



A GOLD ONE-MINUTE SPRING-DETENT CHRONOMETER TOURBILLON

One-minute *tourbillon* with Earnshaw spring-detent escapement, three-armed carriage, stainless-steel balance with eccentric weights for regulation, Elinvar balance spring with terminal curve, silver engine-turned dial with retrograde hour hand, blued-steel hands, gold engine-turned case. 60mm diameter. Signed Geo. Daniels, London, che.

A GOLD ONE-MINUTE SPRING-DETENT CHRONOMETER TOURBILLON

Gilt brass construction with two going-barrels engaging a common, offset centre-pinion. 36-hour duration. Earnshaw's spring-detent chronometer

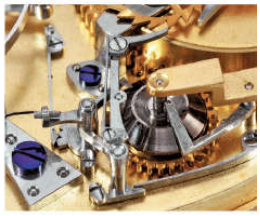
escapement mounted in a polished-steel one-minute *tourbillon* carriage under a polished steel bridge. Monometallic, stainless-steel, four-arm balance with gold adjusting weights. Overcoil balance spring with isochronal adjusting screw. Retrograde hour-hand mechanism. Silver engine-turned dial with polished minutes chapter ring and quadrant for the retrograde hour hand. Large interlaced seconds ring with cartouches either side. 18K gold engine-turned open face case. 62mm diameter. Signed Geo. Daniels, London, sjd.

A GOLD ONE-MINUTE SPRING DETENT CHRONOMETER TOURBILLON WITH RESERVE OF WINDING INDICATION

Gilt brass construction with two going-barrels engaging a common, offset centre-pinion. 36-hour duration. Earnshaw's spring-detent chronometer escapement mounted in a polished-steel one-minute *tourbillon* carriage under a polished-steel bridge. Monometallic, stainless-steel, four-arm balance with gold adjusting weights. Overcoil balance spring with isochronal adjusting screw. Differential screw winding indication and retrograde hour hand mechanism. Silver engine-turned dial with polished minutes chapter ring and quadrant for the retrograde hour hand. Sector at 9.30 for reserve of winding indication. Large interlaced seconds ring with cartouches either side. Blued-steel Daniels hands. 18K gold engine-turned open-face case. 62mm diameter. Signed Geo. Daniels, London, te.

A GOLD ONE-MINUTE SPRING-DETENT CHRONOMETER TOURBILLON

Gilt brass construction with two going-barrels engaging a common, offset centre-pinion. 36-hour duration. Earnshaw's spring-detent chronometer escapement mounted in a polished-steel one-minute *tourbillon* carriage under a polished-steel bridge. Monometallic, stainless-steel, four-arm balance with gold adjusting weights. Overcoil balance spring with isochronal adjusting screw. Retrograde hour hand mechanism. Silver engine-turned dial with polished minutes chapter ring and quadrant for the retrograde hour hand. Large interlaced seconds ring with cartouches either side signed Daniels and London. Blued-steel Daniels hands, the couterpoise in the form of the letter 'S'. 18K gold engine-turned open-face case with Daniels pendand and bow. 62mm diameter. Signed Geo. Daniels, London, gss.



A GOLD ONE-MINUTE DANIELS SPRING-DETENT CHRONOMETER TOURBILLON WITH FIFTEEN-SECOND REMONTOIRE AND EQUATION OF TIME

Watch with one-minute *tourbillon* with fifteen-second remontoire, two-armed carriage, reversed spring-detent escapement, stainless-steel balance with recessed screws, Elinvar balance spring with terminal curve, silver engine-turned dial with sectors for equation of time and state of winding, gold hands, engine-turned gold case. 60mm diameter. Signed Daniels London.

Component details of the watch illustrated in Plate 36.

THE FIRST DANIELS ESCAPEMENT WATCH. A GOLD WATCH WITH DANIELS INDEPENDENT DOUBLE-WHEEL ESCAPEMENT

The first Daniels escapement watch. Gilt brass, Lepine-calibre construction. 32-hour duration. Two going-barrels with two contra-rotating identical trains driving the two escape wheels of the Daniels independent double-wheel escapement, incorporating a ‘T’ shaped central locking detent with three pallets. Mechanism for setting the seconds hand to zero. Monometallic, stainless-steel four-arm balance with gold adjusting weights and free-sprung overcoil balance spring. Differential winding indication with balance arresting device. Silver engine-turned dial with the chapter ring below a large seconds ring. Quadrant for the reserve of winding to the right. 18K gold engine-turned open-face case with Daniels pendant and bow. 62mm diameter. Signed on the main movement bridge ‘Especially made for Seth G. Atwood. Daniels London’.

A GOLD WATCH WITH DANIELS INDEPENDENT DOUBLE-WHEEL ESCAPEMENT

Gilt brass, Lepine-calibre construction. 32-hour duration. Two going-barrels with two contra-rotating identical trains driving the two escape

wheels of the Daniels independent double-wheel escapement, incorporating a ‘Y’ shaped central locking detent with three pallets. Mechanism for setting the seconds hand to zero. Monometallic, stainless-steel four-arm balance with gold adjusting weights and free-sprung overcoil balance spring. Signed on the main movement bridge Daniels, London. Silver engine-turned dial with the chapter ring below a large seconds ring. Signed Daniels and London in two cartouches either side of the dial. Gold Daniels hands. 18K gold engine-turned open-face case with Daniels pendant and bow. 62mm diameter.

A GOLD WATCH WITH DANIELS INDEPENDENT DOUBLE-WHEEL ESCAPEMENT

Watch with two trains and Daniels independent double-wheel escapement, stainless-steel balance wheel with eccentric weights for regulation, Elinvar balance spring with terminal curve, silver engine-turned dial with sectors for thermometer and state of winding, seconds

above with provision for setting to zero, gold hands, gold engine-turned case. 59mm diameter. Signed Daniels London.

A GOLD WATCH WITH DANIELS INDEPENDENT DOUBLE-WHEEL ESCAPEMENT

Gilt brass, Lepine-calibre construction. 32-hour duration. Two going-barrels with two contra-rotating identical trains driving the two escape wheels of the Daniels independent double-wheel escapement, incorporating a ‘Y’ shaped central locking detent with three pallets. Mechanism for setting the seconds hand to zero. Monometallic, stainless-steel four-arm balance with gold adjusting weights and free-sprung overcoil balance spring. Differential winding indication with balance arresting device. Bimetallic thermometer. Silver engine-turned dial with the chapter ring below a large seconds ring. Quadrants for the temperature to the left and reserve of winding to the right. 18K gold

engine-turned open-face case with Daniels pendant and bow. 62mm diameter. Signed Daniels London.

A GOLD WATCH WITH DANIELS INDEPENDENT DOUBLE-WHEEL ESCAPEMENT

Gilt brass, Lepine-calibre construction. 32-hour duration. Two going-barrels with two contra-rotating identical trains driving the two escape wheels of the Daniels independent double-wheel escapement, incorporating a ‘Y’ shaped central locking detent with three pallets. Mechanism for setting the seconds hand to zero. Monometallic, stainless-steel three-armed recessed balance with gold adjusting screws. Daniels auxiliary compensation and free-sprung overcoil balance spring. Differential screw winding indication. Bimetallic thermometer below the dial. Silver engine-turned dial with the chapter ring below a large seconds ring. Quadrants for the temperature to the left and reserve of winding to

the right. 18K gold engine-turned open-face case with Daniels pendant and bow. 62mm diameter. Signed Daniels London.

THE FIRST DANIELS SPACE TRAVELLER'S WATCH

Watch showing solar and sidereal time. Independent trains with Daniels double escapement with wheels of unequal numbers of teeth. Silver engine-turned dial with 24-hour chapter ring for sidereal time on the left, and containing moon-phase disc and gilt sector showing age of the moon. Mean solar chapter ring to the right and containing aperture for the calendar. Seconds below for sidereal and mean solar. Sector for equation of time above. Gold engine-turned case. Signed Daniels London. See Plate 58.

THE SECOND DANIELS SPACE TRAVELLER'S WATCH

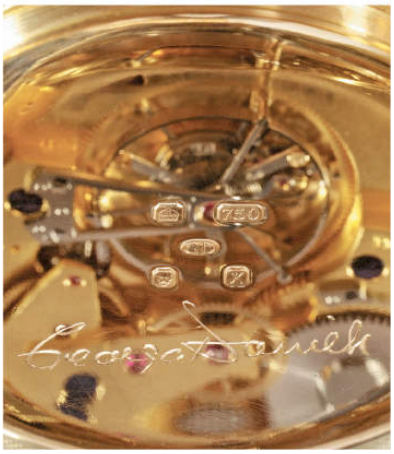
Solar and sidereal watch with chronograph to show solar or sidereal seconds as required. The dial as for Plate 43 but with the addition of centre seconds. Double-wheel escapement with wheels of 13 for sidereal time and 14 for solar time. Gold engine-turned case. For a description of the mechanism see Plate 59. Signed Daniels.

Details of solar/sidereal watch illustrated in Plate 43.

THE FIRST DANIELS CO-AXIAL WATCH. A GOLD ONE-MINUTE TOURBILLON WITH DANIELS CO-AXIAL ESCAPEMENT

Watch with one-minute *tourbillon* with Daniels co-axial escapement, two-armed carriage, stainless-steel balance with bi-metallic attachments for residual temperature correction, eccentric weights for regulation, Elinvar balance spring with terminal curve, silver engine-turned dial with sector for the state of winding, gold hands, gold engine-turned case. 60mm diameter. Signed Daniels London on the dial and Daniels on the movement.

Component details of the watch illustrated in Plate 45.



A GOLD ONE-MINUTE TOURBILLON WITH DANIELS CO-AXIAL ESCAPEMENT

Gilt brass construction with single going-barrel. 32-hour duration. Daniels co-axial escapement mounted in a steel one-minute, edge-driven *tourbillon* carriage under a steel and brass balance cock. Monometallic, stainless-steel, three-arm balance with gold adjusting weights. Free-sprung overcoil balance spring. Daniels three-position keyless winding. Silver engine-turned dial with eccentric polished-gold chapter rings. 18K gold engine-turned open-face case with Daniels pendant and bow. Hallmarked London 1984, case-maker's mark GD. Engraved with a facsimile signature George Daniels inside the rear cover. 63mm diameter. Signed Daniels London.

A GOLD ONE-MINUTE TOURBILLON WITH DANIELS CO-AXIAL ESCAPEMENT

Watch with one-minute *tourbillon* with Daniels co-axial escapement and keyless winding. Six-armed carriage with three-armed upper bridge and outer ring of driven teeth. Three-armed stainless-steel balance with eccentric gold weights for regulation. Silver engine-turned dial with inset gold chapter rings and signature plaques. Gold engine-turned case. Three-position pendant. First position as illustrated. Second and third positions for winding and hand-setting. Movement signed Daniels. Dial signed Daniels and London in two cartouches.

Bottom right: Under-dial view showing the three-position winding mechanism.

A GOLD POCKET CHRONOMETER WITH DANIELS SLIM CO-AXIAL ESCAPEMENT

Pocket chronometer with Daniels co-axial escapement, steel balance with Invar spring with terminal curve, free-sprung mechanism for indicating jump seconds, three-position pendant for winding and hand-setting, silver dial with gold chapters, subsidiary sectors for reserve of winding and thermometer. Signed Daniels London.

A GOLD POCKET CHRONOMETER WITH DANIELS SLIM CO-AXIAL ESCAPEMENT

Gilt brass, Lepine-calibre construction. 48-hour duration, with single going-barrel, Daniels three-position keyless winding and differential screw-winding indicator. Daniels slim co-axial escapement with eight-tooth escape wheels; monometallic, stainless-steel, four-arm balance with gold adjusting weights and free-sprung overcoil balance spring. Independent dead-seconds mechanism consisting of an eight-tooth star

wheel mounted on the fifth wheel arbour advancing a sixty-tooth ratchet wheel on an arbour carrying the seconds hand. Silver engine-turned dial with eccentric polished chapter ring, large interlaced second ring and sector at 10.30 for reserve of winding. Gold Daniels hands. 18K gold engine-turned open-face case with Daniels keyless pendant and bow. 63mm diameter. Signed Daniels London.

THE DANIELS GRANDE COMPLICATION WATCH. A GOLD ONE-MINUTE TOURBILLON WITH DANIELS SLIM CO-AXIAL ESCAPEMENT, MINUTE-REPEATING, INSTANTANEOUS PERPETUAL CALENDAR, EQUATION OF TIME, PHASE OF THE MOON, THERMOMETER AND INDICATION OF THE RESERVE OF WINDING

Gilt brass construction with single going-barrel. 36-hour duration. Daniels slim co-axial escapement mounted in a polished-steel one-minute *tourbillon* carriage under a polished-steel balance cock. Monometallic, stainless-steel, three-arm balance with gold adjusting weights. Differential screw mechanism for the reserve of winding. Instantaneous perpetual

calendar mechanism to Daniels' design with retrograde date and indication of leap-year cycle. Annual calendar ring with kidney cam and equation of time indication. Minute-repeating mechanism striking on two gongs. Bimetallic thermometer. Silver engine-turned dial with polished-gold chapter and seconds rings. Polished-silver quadrants for the concentric date indication and, within the seconds ring, for the centigrade thermometer. Subsidiary silver dials for the day of the week and month with concentric leap-year cycle indication. Aperture at 12.00 for the phase of the moon disc. Gold Daniels hands for the hours, minutes and seconds, blued-steel calendar hands. 18K gold open-face case with Daniels keyless pendant and bow. Repeating slide and calendar setting in the band of the case. Glazed aperture in the back, revealing quadrants for the equation of time, year calendar and reserve of winding. 61mm diameter. Signed Daniels London.

A GOLD DANIELS CO-AXIAL FOUR-MINUTE TOURBILLON WITH CHRONOGRAPH

Gilt brass construction. 48-hour duration, with two going-barrels and Daniels three-position keyless winding and differential screw-winding indicator. Daniels co-axial escapement mounted in a polished-steel four-minute *tourbillon* carriage under a polished-steel bridge. Monometallic, stainless-steel, four-arm balance with gold adjusting weights and free-sprung overcoil balance spring. Daniels compact chronograph mechanism to the right of the *tourbillon* carriage. Silver engine-turned dial with eccentric polished-gold chapter rings, and quadrant for the reserve of winding below twelve. Interlaced continuous seconds to the right and chronograph seconds with concentric minute recording to the left. 18K gold open-face case with Daniels keyless pendant and bow. Twin

chronograph buttons in the band of the case for stop/start and return to zero. 68mm diameter. Signed Daniels London.

1–7 Component details of the watch illustrated in Plate 33.

8–12 Component details of the watch illustrated in Plate 40.

13 Co-axial escapement fitted to wristwatch movement.

14 Hallmarks of the Worshipful Company of Goldsmiths, London and case-maker's punch mark.

15 Pivoted detent *tourbillon* carriage.

East wall looking north, showing small work benches with 8mm lathes, jewelling lathe, large and small drilling machines.

East wall looking south, showing finishing bench with raised centre, jewelling bench, timing bench, Haswell regulator, optical comparator.

Detail of jewelling and timing benches, showing hand turns, jewelling tools, staking tools, pivot-polishing machines, timing machines for long- and short-run observations. The clock above is radio monitored to show exact GMT.

Detail of north-east corner showing engine-turning machine, pantograph milling machine, case-making press, rolls and anvil. The antique brass tools and engines can occasionally be very useful and were at one time the everyday tools of the watchmaker.

Detail of raised finishing areas showing the watch illustrated in Plate 39 at an advanced stage of production. The parts are ready for assembly and examination prior to final finishing and gilding.

Detail of south-east corner showing optical comparator and jig borer for small, high-precision work.

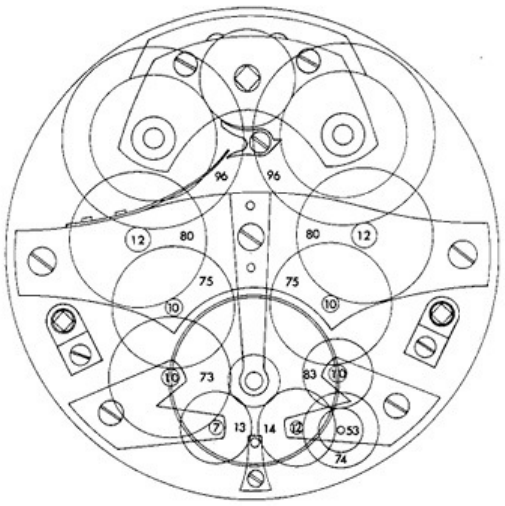
West wall looking south, showing photographic bench, screw-cutting lathe, general work benches, precision lathes for turning, wheel-cutting, etc.

West wall looking north, showing pinion-cutting and polishing bench, furnace, wet benches with ultrasonic bath and electro-plating apparatus.

Wheel arrangement for solar/sidereal watches

Fig. A *Wheel train calculations for the solar/sidereal watches*

Sidereal train:



$80 \times \frac{75}{10} \times \frac{83}{10} \times \frac{37}{53} \times \frac{28}{6} = 16{,}268.571$ vibrations per solar hour

Solar train:

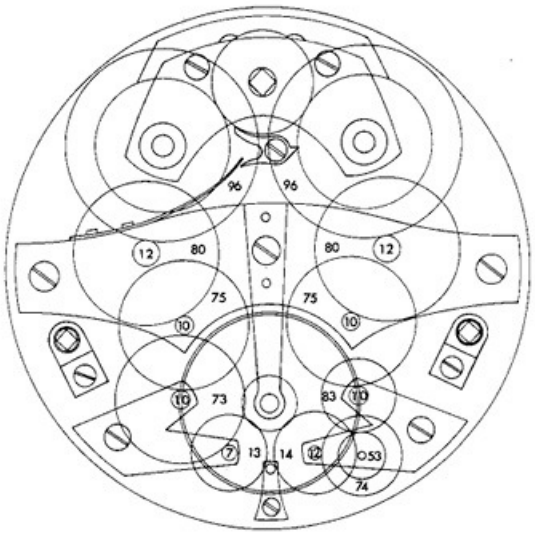
$80 \times \frac{75}{10} \times \frac{73}{10} \times \frac{26}{7} = 16{,}224.15$ vibrations per solar hour

$\frac{16{,}268.571}{16{,}224.15} = 1 : 1.002737924$

A better figure would be 1.002737909 and the difference is 0.000000015. 0.15^{-8} x 31,557,600 solar seconds per year = 0.4 seconds fast per year.

Fig. B *Calculations for moon phases and equation of time*

The moon train derives from the sidereal motion work:



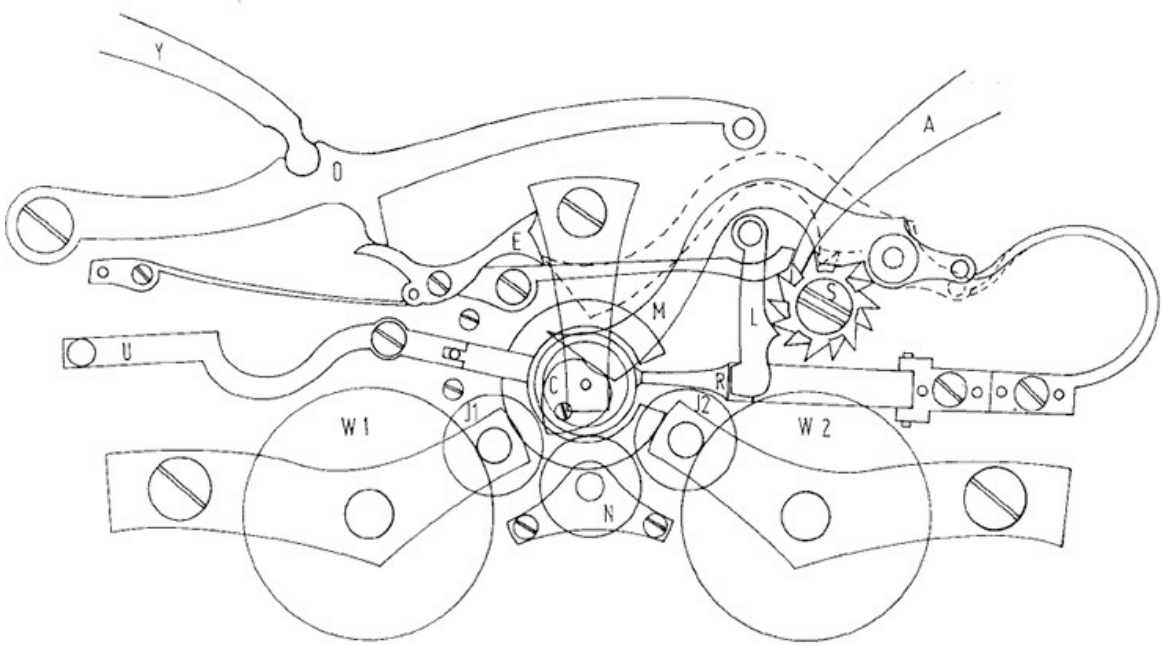
$$\frac{87}{2} \times \frac{113}{83} \times \frac{59.222891}{2} = 29.611445$$ sidereal days per lunar cycle

$$\frac{29.611445}{1.002737909} = 29.530593$$ solar days per lunar cycle

= 0.422 second slow

The equation is derived from the solar motion work:

$$\frac{73}{4} \times \frac{40}{2} = 365$$ days per revolution of the equation cam.



Action of the chronograph mechanism

Fig. C The wheels *W1* of the solar train and *W2* of the sidereal train drive wheels *J1* and *J2* continuously while the watch is running. The intermediate wheel *N* can be engaged by lever *U* with either *J1* or *J2* to drive the seconds hand, carried on the arbor of wheel *C*, to show either sidereal or solar seconds. As illustrated, lever *L* is resting on the ramp of clutch lever *R* to disengage the clutch and stop the seconds hand. When *A* is pushed by the button in the band of the case, *S* is turned one tooth to release lever *L* and allow *R* to rise and engage the clutch carried on the arbor of the seconds hand. At the same moment, zeroing lever *M* is raised to rest on catch *E*. When *A* is again pushed, *L* is lifted onto the ramp of *R* to disengage the clutch and stop the seconds hand, but *M* remains locked on *E*. To zero the seconds hand, *Y* is pressed by the second button in the band of the case to lift *E* and release *M*, which falls onto the zeroing cam on wheel *C*.

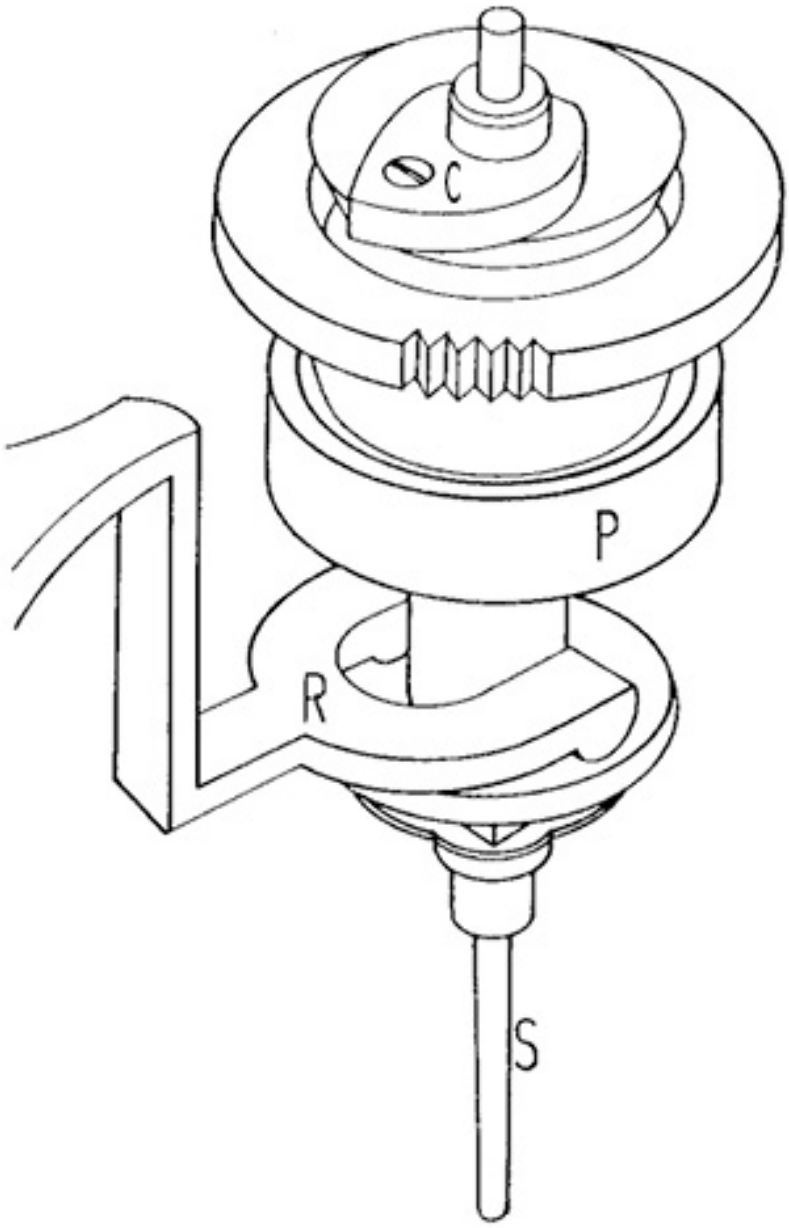
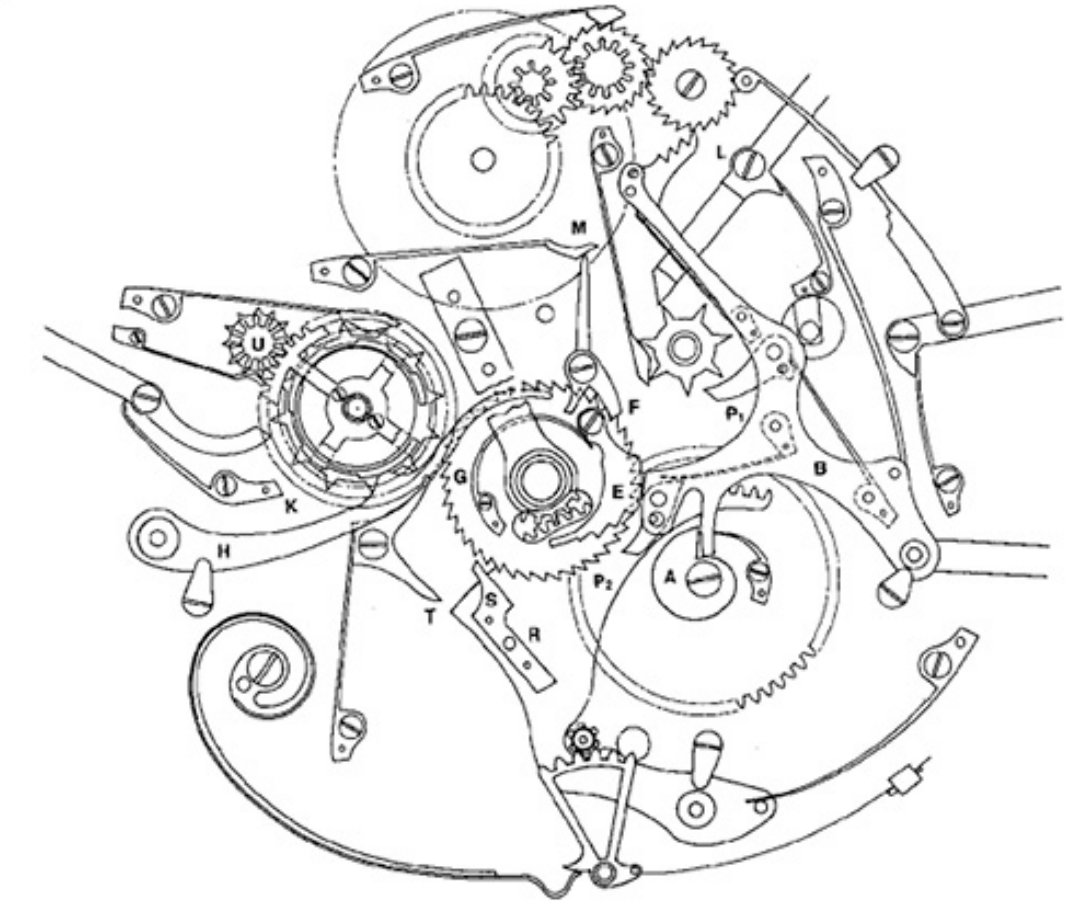


Fig. D The clutch is engaged by the bow spring beneath and released by the fork of *R*, drawing down the clutch cone *P* to allow wheel *C* to rotate idly on the seconds arbor *S*.



Perpetual-Calendar Mechanism

Cam *A* turns once in 24 hours to lift *B* and cause pawl *L* to advance the moon train three teeth. When *B* falls to the position shown it allows pawl *P1* to advance the day wheel and *P2* to advance the date wheel *G*.

Wheel *G* carries the stepped release catch *E*. At the end of each month the appropriate step of *E* will lift aside pawl *F* to allow *G* to be returned to the first day of the month by rack *R*. In this position the pivoted end of *E* will touch the tail of pawl *F* to return it to the gathering position seen as at the first of the month.

As the rack returns, the piece *S* catches the advancing lever *T* to advance the wheel *K* to the next month.

The appropriate step of *E* is selected by the position of *H* riding on the edge of the month cam of wheel *K*. The twelve-toothed planet wheel *U* is

turned once per year by wheel *K*. Within wheel *K* is the leap-year cam, geared 4:1 with the planet pinion.

Components of the watch illustrated in Plate 51.

GEORGE DANIELS CO-AXIAL ESCAPEMENT MILLENIUM WRIST WATCH

Every part of a Daniels watch is individually hand finished and assembled. The '*ébauche*' is specially prepared and supplied exclusively to Daniels London. All other components are made by hand for each watch.

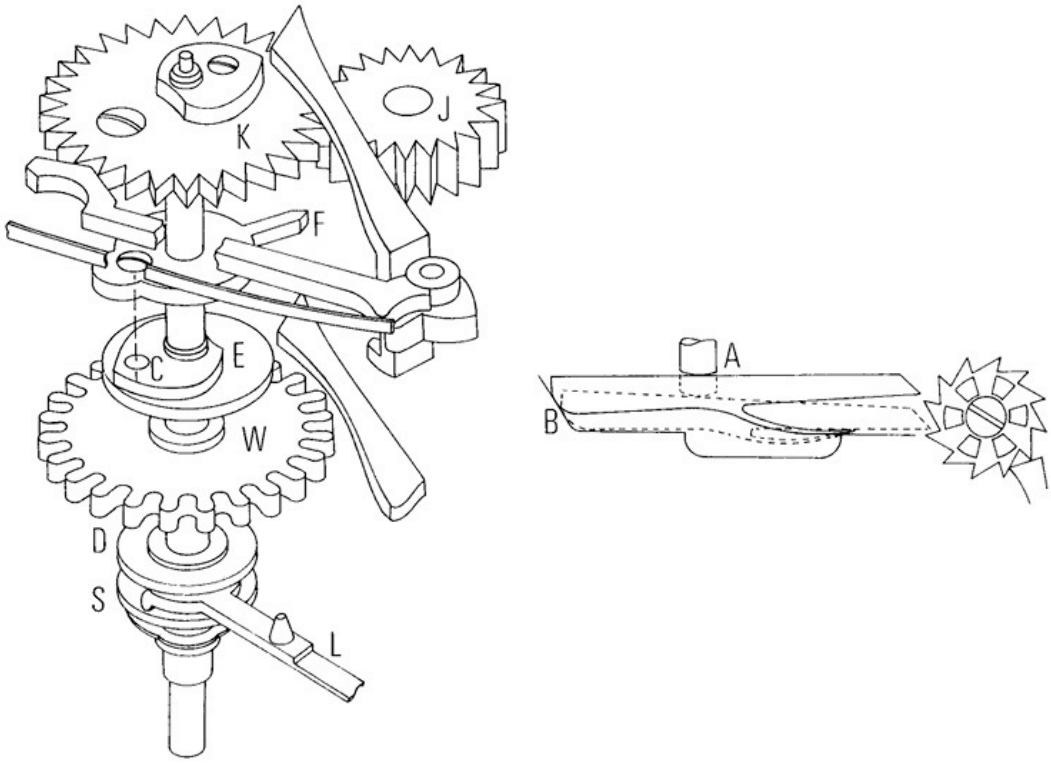
The self-winding movements are finished in the English style with gilded plates and blued screws. Fitted with Daniels co-axial escapements and free-sprung balances with adjusting screws, they are assured of outstanding timekeeping and long-term reliability. This performance is maintained by the 18K gold *guilloché* winding weight, which keeps the mainspring wound in use.

The dials of sterling silver are finished with differing *guilloché* surfaces for the three separate zones. The chapter and calendar rings are of 18K gold and hand-engraved. The 18K gold hands are saw-cut from the raw

material, filed to shape and finished by hand. The 18K gold cases are fitted with sapphire crystals to both front and back. The hand-setting crown is machined from 18K gold as is the hallmarked buckle on the hand-stitched leather strap.

A white-gold automatic wristwatch with date and Daniels slim co-axial escapement, millennium with monometallic free-sprung balance, gold engine-turned rotor, eccentric outer rim with engraved foliate decoration. Silver engine-turned dial, blued-steel Daniels hands, centre seconds, eccentric silver chapter ring, silver date ring with silver cartouches either side. 18K circular case with moulded bezel, winding crown positioned between 7 and 8 o’clock, sapphire crystal display case back. 37mm diameter.

A gold automatic prototype wristwatch with date and Daniels slim co-axial escapement, millennium with nickel movement, monometallic balance. Silver engine-turned dial, gold Daniels hands, centre seconds, eccentric gold chapter ring, gold date ring with cartouches either side. 18K circular case with moulded bezel, winding crown positioned between 7 and 8 o'clock. 36mm diameter.

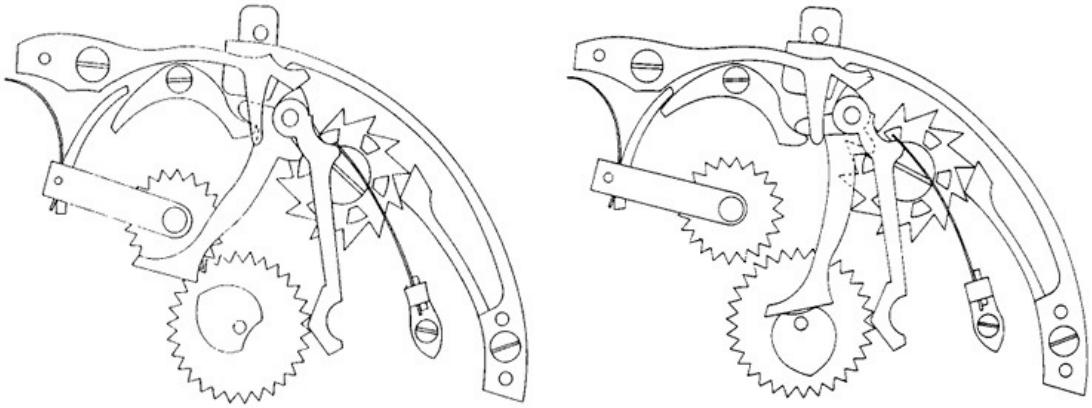


Action of Chronograph

The wheel *W* is free-running on the hollow arbour *E* and rotates continuously in engagement with the toothed edge of the *tourbillon* carriage.

Cam *C* and finger *F* are fixed to *E*. Wheel *K*, with its cam, is fixed to the minute-recording arbour passing through *E*.

When clutch lever *L* is raised, spring *S* will press *W* into contact with faces *D* and the underside of *E* to start the seconds hand. At each turn of *E* the finger *F* will engage the intermediate wheel *J* to advance *K* one tooth for each elapsed minute. When *W* is disengaged to stop the seconds hand, both cams can be reset by the zeroing levers.



Action of Pillar Wheel

Pressure at *A* from the chronograph button in the case will cause the pillar-wheel pawl to slide to the right, down the ramp at *B* to engage a ratchet tooth. Further pressure will advance the pillar wheel one tooth. When released the pawl spring will raise the point of the pawl so that it will be pushed back to the left by the slope of the ratchet tooth.

The diagrams below show the action engaged, to the left, and disengaged, to the right, with cams zeroed.

Chronograph wristwatch, four-minute *tourbillon* with Daniels co-axial escapement, Invar balance spring with terminal curve free-sprung, chronograph set into the plate to avoid increased height to the movement. Silver dial with subsidiary dials for continuous seconds to the right, chronograph seconds with minute indicator to the left, reserve of winding sector above. Gold hands. Signed Daniels.

A GOLD, DOUBLE-DIALLED, ONE-MINUTE TOURBILLON CALENDAR WRISTWATCH WITH DANIELS SLIM CO-AXIAL ESCAPEMENT

Wristwatch with one-minute *tourbillon* and Daniels co-axial escapement, balance with eccentric gold adjusting weights. Invar balance spring with terminal curve free-sprung. Silver dial with gold chapter rings, subsidiary

dial for seconds and reserve of winding. Gold hands. Reverse dial with day and date revealed by pressing the button at 8 o’clock position while the watch is carried on the wrist. Signed Daniels London.

Stainless-steel automatic wristwatch with date containing the first ETA co-axial movement, Hamilton Watch Co. circa 1996. Nickel ETA movement, calibre 2892A2, 21 jewels, monometallic balance, slim co-axial escapement. Silvered dial, arabic numerals, centre seconds, aperture for date. Circular polished case with protected crown, snap-on case back. 32mm diameter.

Stainless-steel automatic chronograph wristwatch with day and date, Omega Speedmaster, circa 1975, customised by George Daniels to use a co-axial escapement. Pink-gilt Omega movement, calibre 1045, 17 jewels, monometallic balance. Black dial, luminous baton numerals and hands, subsidiary dials for constant seconds, 12-hour register and 24-hour indication, apertures for day and date, outer track calibrated for tachometer. Satin finish tonneau case with screw-down case back, satin finish bracelet with folding clasp. 41mm diameter.

Prototype movement with slim co-axial escapement, Patek Philippe, one of three produced. Gilt brass movement, slim co-axial escapement, monometallic balance, 29 jewels, adjusted to heat, cold, isochronism and 5 positions, mounted in a brass circular stand glazed top and bottom. 27.5mm diameter.

Stainless-steel automatic wristwatch with date, Rolex, Oyster Perpetual, Datejust, circa 1985. Customised by George Daniels to use a slim co-axial escapement. Nickel movement, calibre 3135, 31 jewels, monometallic balance. White dial, applied baton numerals, centre seconds, aperture for date. Circular Oyster case with screw-down case back and crown, milled bezel, Rolex Jubilee bracelet with folding clasp. 36mm diameter.

Gold automatic triple-calendar chronograph wristwatch with moon phase, Urban Jurgensen, circa 1985. Customised by George Daniels to use a slim co-axial escapement. Gilt Zenith movement, calibre 3019PHF, 17 jewels, monometallic balance. Silvered dial with engine-turned centre, roman numerals, blued-steel moon hands, subsidiary dials for constant seconds, 30-minute and 12-hour register combined with moon-phase,

apertures for day, date and month. 18K circular case with moulded bezel, teardrop form lugs, screw-down case back. 40mm diameter.

Stainless-steel automatic wristwatch with date, Patek Philippe, Nautilus, circa 1982. Customised by George Daniels to use a slim co-axial escapement. Nickel movement, 29 jewels. Black ribbed dial, applied luminous numerals and hands, centre seconds, aperture for date. Satin finish Nautilus case with protected crown, faceted bezel, polished and satin-finish link bracelet with folding clasp. 37mm diameter.

Gold automatic wristwatch with date and co-axial escapement, Omega, Chronometer, limited edition no. 000/999, 1999. Rhodium-plated movement, calibre 2500, 27 jewels. Silvered pie-crust dial, roman and faceted wedge-shaped numerals, luminous hands, centre seconds, aperture for date. 18K circular case with protected crown, stepped bezel and lugs, screw-down case back engraved with inscription ‘To Our Friend George Daniels from Omega Ltd. April 30, 1999’. 38mm diameter.

Pamela Newman, George, David Newman, Buckingham Palace CBE Investiture, 21 May 2010.

Plaque on organ at Kirk Christ Church, Lezayre, Isle of Man.

Workshop and Riversdale from rear garden.

George with Nicolas Hayek, President of the Swatch Group, Baselworld 2010.

George with Stephen Urquhart, President of Omega, Baselworld 2010

Reception, Government House, Isle of Man, 2010. Lady Haddacks, Roger Smith, David Newman, George, His Excellency Vice Admiral Sir Paul Haddacks.

A Horological CBE Celebration Dinner, RAC Club London. Top row, left to right: Michael Turner, David Poole, David Newman, Roger Smith. Bottom row: Andrew King, Jonathan Betts, George, Pamela Newman, Caroline Smith.

‘Blue’

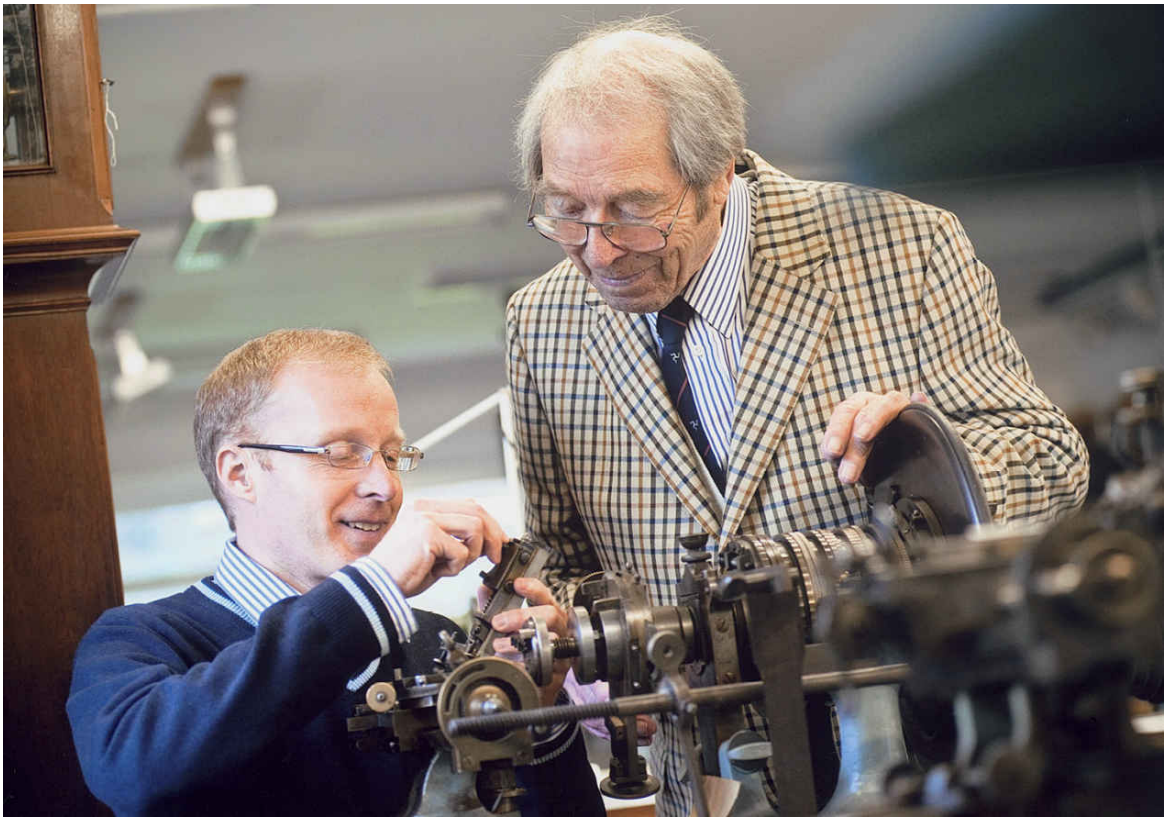
‘White’

2001–2004: Two completely handmade white-gold rectangular cased *tourbillon* wristwatches fitted with the Daniels co-axial escapement and a calendar complication, designed by Dr George Daniels and signed Daniels London. The watches are known as ‘Blue’ and ‘White’ after their different coloured dial batons – one set made from blued steel and the other, white gold.

Pictured is the under-dial view of the Daniels ‘White’

A horological dinner in London. Roger Smith, George, F.P. Journe.

George with Roger Smith working on the Co-axial Anniversary Collaboration Project, Riversdale, 2010.



George with Roger Smith in the workshop at Riversdale.

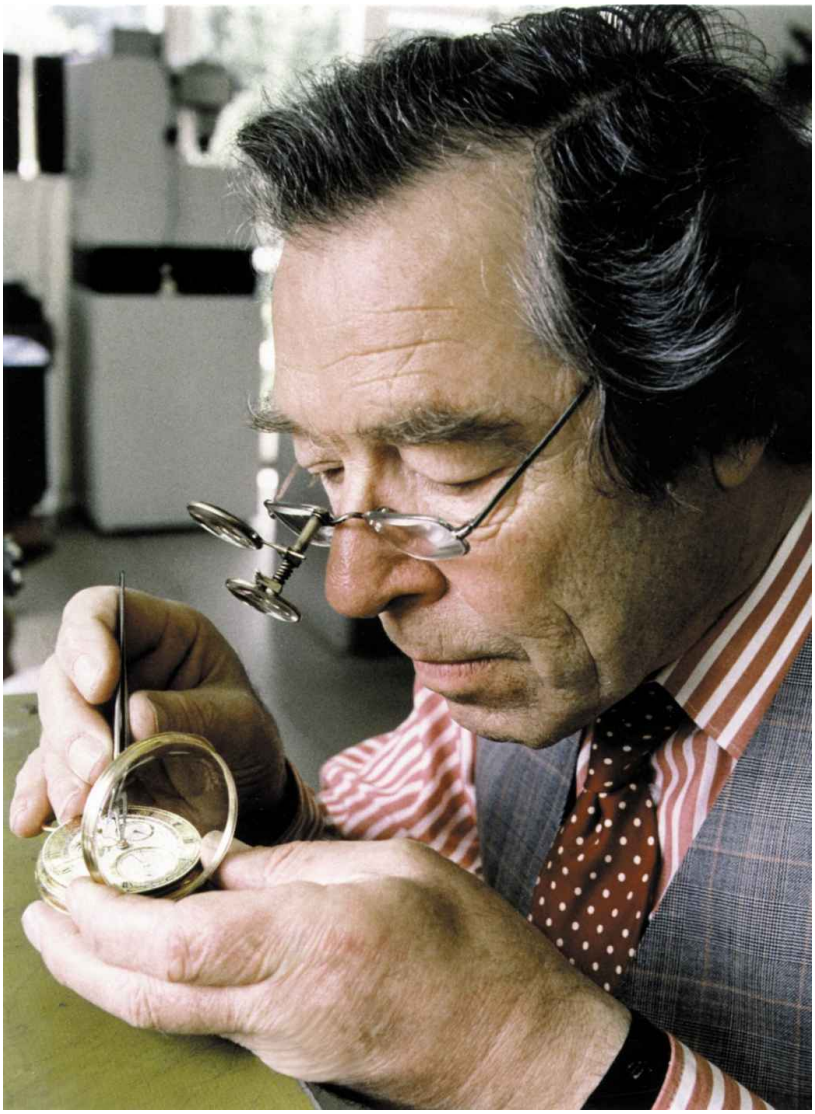
In the workshop at Riversdale.

2012: Dr George Daniels' collaboration with Roger Smith on the Co-axial Anniversary wristwatch to celebrate thirty-five years since George's invention of the co-axial escapement. The remit was to design and make a completely new Daniels wrist watch movement. The very first production Daniels wristwatch to have been designed and made in its entirety within the shores of the Isle of Man – limited edition.

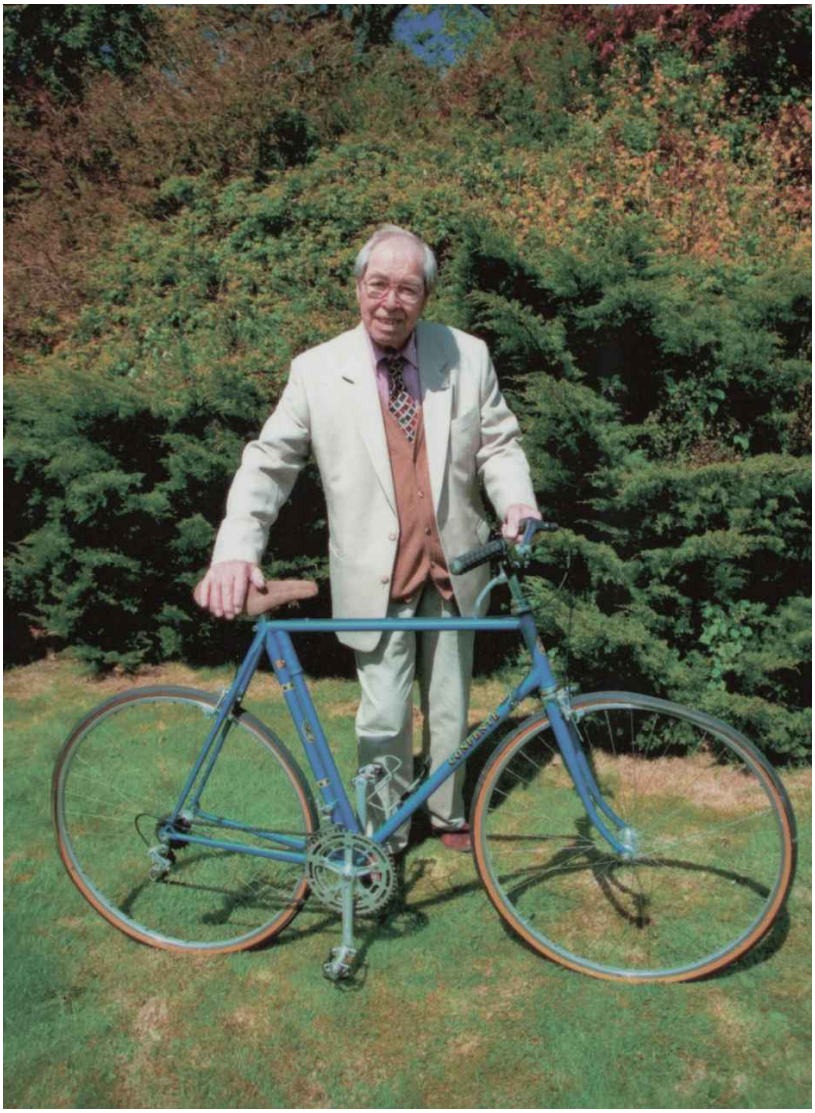
Pictured is the Daniels No. 1, front and back.

Back view of the Daniels Anniversary movement.

Under-dial view of the Daniels Anniversary movement.



George around 1980.



With the Confente bicycle.

The single-seater at the Royal Automobile Club, London, 2011.

Driving the single-seater Bentley on the Brooklands Banking.

‘My first watch had to be accepted as a work of art in its own right, as an artificial object of original conception, constructed with integrity, that would intrigue, amuse and educate the human mind. And if it was to attract the connoisseur who for sixty years had been deprived of the opportunity to buy a handmade London watch, it had to have some special mechanical interest. The electronic watch was gaining ground rapidly in the 1960s and manufacturers were claiming it as the watch of the future. The mechanical watch, they said, would die before the end of the century. I did not believe this…’

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